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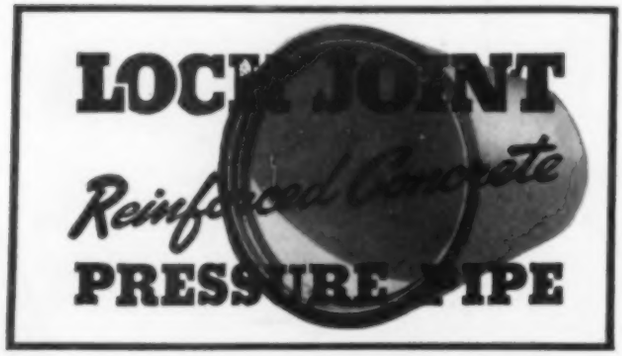

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ROBERT S. WILMOT supplemented his undergraduate work (Brown U. '41) by a short period of graduate study in structures at Yale and a year in the design office of Phelps Dodge. During three years in the Army his most useful service has been since January 1945, conducting malaria work in Assam and China, with the 123rd Malaria Control Detachment.

JOHN K. MINASIAN (Calif. Inst. of Tech., B.S. '38, M.S. '44) after 2 years as a construction engr. and 1 year as research engr. on earthquake analysis for Cal-Tech, entered the employ of the City of Los Angeles, serving in the Bridge Dept., the Dept. of Water and Power, and at present in the Dept. of Building and Safety, as Building Structural Engr.

R. C. CRAWFORD (U.S. Military Academy '12, Command and Gen. Staff School, War College) was commissioned in the Corps of Engineers and is now a brig. gen. As commandant of the Fort Belvoir Engineer School he received the Distinguished Service Medal for training combat Engineer soldiers. He was with the General Staff, and for 2 years Div. Engr., Missouri River Div. Since Dec. 1945 he has been Assistant to the Chief of Engineers.

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HOWARD ELLIS DAVIS (Ala. Poly. Inst.) spent 4 years in fiction writing following service in World War I as a major. In 1923 he began his career as a reservoir engineer with the Dixie Construction Co., which was then engaged on Martin Dam for the Alabama Power Co. He joined the TVA in 1933, and until July 1945 directed all reservoir clearing operations for dams under construction.

NOTE: *On the contents page of the January 1946 issue, Howard Ellis Davis was erroneously credited with having built Martin Dam on the Tallapoosa River. Instead, C. C. Davis was construction engineer for the Alabama Power Co. on this dam.*

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The Future of Resource Engineering

By KENNETH MARKWELL, M. ASCE
ASSISTANT COMMISSIONER, BUREAU OF RECLAMATION, WASHINGTON, D.C.

FURTHER development of the West through irrigation and power expansion will lead to tremendous economic gains for the nation as a whole as well as for the western states. This is the thesis here presented by Mr. Markwell. It is not just a matter of commercial development either, he believes, but of supporting our ripening culture and preventing it from following the example of European nations that reached out for empire to secure food and raw materials. "Resource engineering" is an effort to postpone indefinitely the fate that has overtaken every previous civilization. This paper was originally presented before the Construction Division at the Society's 1946 Annual Meeting.

AS the United States matures economically, socially, and politically there is a phase of engineering work which is becoming increasingly important. It deals with the fuller use and conservation of our resources. There was a time when vast prairies of rich, uncultivated soil appeared to provide an unlimited supply of food and fiber, when extensive deposits of metals and other minerals provided a seemingly inexhaustible supply of materials upon which our industry could be expanded, when water supplies for our cities appeared to be sufficiently abundant.

Recklessly we mined the soil of our farms and allowed it to waste into our drainage waterways. Ruthlessly we cut away the forests that conserved moisture. Lush grasslands which provided our supply of cheap beef were overgrazed. Floods devastated millions of acres, and streams were polluted.

The day is gone when this can be permitted to continue recklessly, and we are faced with the necessity of rebuilding our soil, bringing under cultivation every new acre that can be farmed economically, harnessing our rivers for power, flood control, and navigation, and in addition, utilizing to best advantage every drop of water in the West.

In the wide expanses west of the 100th meridian, which include all of the eleven arid states and the semi-arid sections of six others, the rainfall generally averages from 3 to 20 inches, except in the high mountains and on a narrow strip along the Pacific Coast north of San Francisco. This precipitation, especially since little of it falls in the growing season, is inadequate to assure sustained crop production. Hence the conservation of all available water and its distribution for irrigation is essential to the maintenance of agriculture in these arid and semi-arid regions. More than 70% of the agricultural production of this area depends on irrigation.

Similarly, the scarcity of fuel for the generation of electric power has led to the development of multiple-purpose projects, through which the double and sometimes triple use of the limited water resources permits the production of low-cost hydro power. Approximately 80% of the power generated in the far western states is produced at hydro projects.

This is the basic reason for the great program of development of the western United States which has been proposed to Congress by the Bureau of Reclamation. This is why the Bureau is seeking nothing less than the full development of the natural resources of our seventeen arid and semi-arid western states. In this constructive effort, maximum beneficial use of water for irrigation and hydroelectric power is the key and limiting factor.

There is nothing new in the limitations placed on national development by resource supply. Throughout history nations have risen in strength and then declined, largely because they depleted or destroyed the resources which nourished them. The search for new land upon which to feed growing populations has led to colonization from the dawn of civilization. When strong nations reached a size beyond which they could not nourish all their people, they sought tribute in grain and other foods from their neighbors. Modern trade has mitigated the need for conquest, but the rebellions taking place today in the Orient attest that trade was not unattended by exploitation.

England was the first of the modern nations to grasp the importance of resource engineering on a grand scale. England's irrigation projects in India dwarf any that were attempted in this country until recent years. Some 50,000,000 acres have been placed under irrigation in India by the British in the effort to feed its teeming population; and in Egypt approximately 6,000,000 acres have been irrigated by the great dams across the Nile constructed by British engineers.

Many of the cultures of the ancient world depended largely on irrigation, and engineering skill in ancient times was developed to a high degree. Only recently a series of ancient dams near Al Taif in Arabia have come to light. The largest was 600 ft across the crest, 50 ft in height, and 26 ft wide. Apparently these dams were important, chiefly in maintaining subterranean water supplies from which numerous wells were fed. These wells dried up when the sluice gates of the dams fell into disrepair, and a flourishing agriculture vanished. Historians have often pondered whence came the economic strength which enabled Arabia in the thirteenth century to support conquering armies and to develop an exuber-

ance of gaudy wealth which became fabulous. This economic strength could have come only from a prosperous agriculture, made possible by the engineers who built the big dams near Al Taif. To have constructed such works without the tools of modern engineering surely required no less ingenuity than engineers of today bring to their tasks.

Now let me briefly trace the development which has brought today's engineers of the Bureau of Reclamation to their present problems. Far-seeing men at a fairly early date in our national history recognized the fact that a tremendous development in the western United States was possible if water in adequate volume could be diverted to the rich soils of the West's arid valleys instead of wasting away to the sea.

When the work required to construct sound irrigation projects reached proportions too great for private enterprise, the federal government was asked to help. Thus, in the administration of Theodore Roosevelt the Reclamation Act of 1902 was placed on the statute books.

Almost from the beginning it was realized that when large irrigation dams were constructed, they could be used also for the production of electric power and other multiple purposes, and that the income from the sale of power could be applied to lessen the cost of irrigation water. As larger dams were built, the importance of power increased.

During the administration of President Hoover the building of dams took on a new aspect. Engineering genius in the Bureau of Reclamation was put to work on the problem of damming the flow of the wild Colorado

SEMINOE DAM ON THE BUREAU OF RECLAMATION'S KENDRICK PROJECT

River, partly for the purpose of regulating its flow to control floods and assure irrigation water for Southern California and Arizona, partly to provide a new source of municipal water for the metropolitan area of Los Angeles in California, the growth of which was being limited by its diminishing water supply. This enterprise also was for the purpose of producing large quantities of hydroelectric power. Flood protection was another objective. The multiple-purpose dam assumed a new importance with this engineering feat.

The next important multiple-purpose project was the experiment put into effect by the Tennessee Valley Authority Act. One of the dominating features here was the production and distribution of hydroelectric power, which not only brought low-cost energy to thousands of farms, but supplied the economic base for the development of much industry in the Tennessee Valley. This experiment has demonstrated its usefulness.

The idea of coordinated river basin resource development today is endorsed by virtually all political groups, although the question of what political agency, or combination of agencies, should direct such enterprises is vigorously debated. Recognizing the vital importance of resource conservation, the Bureau of Reclamation is proceeding with studies looking toward the coordinated development of all the great river valleys of the West. In 1944, the Secretary of the Interior reported to the President and to Congress on a plan for such development in the Missouri Valley. This report was coordinated with one of the Corps of Engineers, forming what has become known as the Pick-Sloan Plan, or the Missouri River Plan.

APPROPRIATIONS FOR MISSOURI RIVER PLAN

Under this plan the construction of about $2,500,000,000 of engineering works was approved by Congress in the Flood Control Act of 1944, which authorized the appropriation of $200,000,000 for construction work by the Corps of Engineers and $200,000,000 by the Bureau of Reclamation toward the accomplishment of the initial phases of the coordinated program. When these approved works have been completed, some 4,760,000 acres more of moisture-starved land in the basin of the Missouri River and its tributaries will have been brought under irrigation, and supplemental water will have been provided to about 500,000 acres now inadequately irrigated. Floods will be controlled on the Missouri and its tributaries and navigation improved. In addition, hydroelectric power plants with a combined capacity of $1\frac{1}{2}$ million kilowatts will be built. The coordinated program will involve construction of more than 100 separate projects, which will stabilize agriculture and industry in the Missouri Valley.

The responsibility of the Department of the Interior in this undertaking is far more extensive than that of the Bureau of Reclamation alone. The Bureau of Mines is engaged in making a survey of the mineral resources in the Missouri River Basin with a view to determining industrial possibilities, particularly with relation to the application of the low-cost power to be developed. Steam power possibilities from the tremendous deposits of lignite that exist in the area also are being studied. The Grazing Service is working on plans for improvement of range lands. The Fish and Wildlife Service is planning the development of new game refuges. The Park Service will report on recreational opportunities. The Geological Survey is making a study of ground and surface water. The Indian Service is seeking to benefit the nation's wards who are on reservations in the basin. All these studies by agencies of the Department of the Interior are being coordinated through the Missouri Basin Reports Staff, set up at Billings, Mont., and it is hoped that the Corps of Engineers, the Department of Agriculture, and the Federal Power Commission, which also are making developmental studies of the region, will use the services of the Reports Staff to assure complete coordination among the several agencies.

It is significant that the cost to the federal government as the result of a drought in the 30's in the Missouri Basin was about one and a quarter billion dollars—an amount approximating the estimated cost of the Reclamation phase of the program.

But the Missouri River Basin is only one of the great river basins of the West for which a report of coordinated resource use will be made within the year by the Bureau of Reclamation. A similar report on the de-

velopment of the 500-mile-long Central Valley of California has just been sent to the Governor of California for review before it is submitted to the President and to Congress. Similar reports on the Columbia River, the Colorado, the Rio Grande, and the Arkansas are in preparation. There will be another on the Great Salt Lake Basin. Other reports will cover the Red River of the South, the Brazos, the Colorado of Texas, the Guadalupe, and the Nueces. Along with the basin reports there will be sub-basin studies and reports on several hundred individual projects.

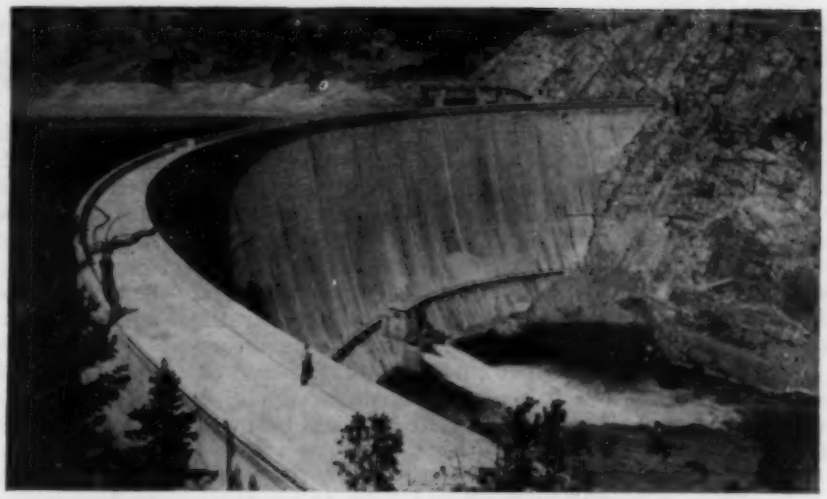
An engineering principle involved in all these basin reports is that it is possible to get a greater and more economical development of the basin as a whole by formulating an overall plan than it is by developing projects separately, without regard to each other. If, for instance, most of the water in any river basin is to be used for navigation purposes, little will remain for irrigation. Or, if an irrigation dam is built for the benefit of special interests at a site where comparatively little farming can be developed, or where twice as much money must be expended to accomplish the irrigation of the same acreage, some other area is likely to suffer. Or it may be that one area with ample water supply, if it is used wisely, can spare water for another area, but it is reluctant to do so unless a clear, coordinated picture of the development is presented by an impartial authority.

It has also become clear that in many instances the cost of an individual project can be reduced considerably when it is undertaken as part of an overall plan.

So the picture of coordinated river basin resource development is growing, although methods of control and operation and ultimate social objectives are still in process of being worked out. An initial step in developing general policy was the establishment, on January 26, 1944, of the Federal Interagency River Basin Committee, on which sit representatives of the War Department, Department of the Interior, Department of Agriculture, and Federal Power Commission. No act of Congress was required to set up this agency, but merely mutual agreement between the agencies involved. This committee meets monthly. On April 26, 1945, this committee established a subsidiary group—the Missouri Basin Interagency Committee, which passes upon similar problems of coordination within the Missouri River Basin. These committees may well prove that they are capable, notwithstanding the divergent interests involved, of developing a coordinated policy which will firmly guide the resource development of that great river valley.

While all the work of the Bureau of Reclamation today is being keyed into the concept of regional resource development, individual projects continue to be developed as a result of local needs. Right now the Bureau is getting started on the biggest construction program in its history. It has approximately $43,000,000 available in carryover funds for projects under construction which were halted by the war, and about $33,000,000 in the regular appropriation for the fiscal year 1946. In addition, the present Congress has recently appropriated additional funds, which bring the funds available in the fiscal year 1946 up to the largest budget the Bureau has ever had for a single year.

For engineers who have worked on Reclamation projects and have seen prosperous farming communities grow up around them, with towns and cities springing out of what was once desert land, these undertakings need no justification. It is easy for Reclamation engineers to assume that the country as a whole must understand the problems of the West and sympathize, but such is far from the case. There are many cross currents of interest within our nation which must be satisfied. Traditionally, eastern farmers have been jealous of western irrigation development, fearing the competition of virgin soil with their land. Eastern manufacturers, seeing new industries develop from the low-cost power of irrigation dams, also tend to be skeptical of the benefits of such competition. Many of them would prefer to see less agriculture in this country, in order that there might be a larger volume of agricultural imports, which would enable foreign customers to build up exchange balances in the United States, with which they might purchase manufactured articles. So it is necessary to justify the expansion of areas under irrigation.



GIBSON DAM ON SUN RIVER, MONTANA, BUILT BY U.S. BUREAU OF RECLAMATION

This is not difficult. Conservative estimates, based on studies made by the Department of Agriculture, forecast the necessity for bringing approximately 40 million acres of new land under cultivation by 1960 to replace marginal and submarginal land, to meet the needs of a growing population, and to supply normal export markets. This calculation takes into account an increasing standard of living as a result of the benefits of an improving technology becoming available to more people. Forty million additional acres also would provide farms for thousands of families now existing on marginal lands, offer new employment opportunities, and vastly increase national purchasing power.

Allowing for an expected improvement in farming methods, and without an increase in the standard of living, the Department of Agriculture estimates that in 1950, only five years hence, the nation could get along on 23,000,000 acres less than were farmed in 1943, or a total of 327,000,000 acres. But the Soil Conservation Service estimates that at least 43,000,000 acres of submarginal land should be retired from production as unfit for efficient, economical use in the production of cultivated crops. Actually, 35,000,000 acres were retired reluctantly in the last decade. If such land were retired without replacement, there would be a deficit of about 20,000,000 acres by 1960.

However, with a population increase by 1960 of about 20,000,000, with some gain in agricultural exports, and with an improving technology bringing about an increase in the purchasing power of the lower income groups, it

seems conservative to agree with the estimate that 40,000,000 new acres of cultivated land will be required within 15 years.

Fortunately, according to the Department of Agriculture, there are 30 to 40 million acres of intrinsically good land that can be made available for settlement. Of this total, from 10 to 20 million acres can be reclaimed in the western states through irrigation. Another 5 million acres of fertile land in the Mississippi delta can be made available through drainage and clearing. Approximately 15 million acres that require drainage and clearing are located at various other points over the country. During the war, the Army and Navy have acquired some 20 million acres of land for military purposes, several million of which are good farm land. When hostilities cease, at least part of that area will be available again for agricultural use.

At present there are under irrigation some 21 million acres. There is enough water that can be diverted economically, under current engineering methods, for the irrigation of only 22 million more acres in all the seventeen western states. The Bureau of Reclamation has submitted to Congress a program under which 10.5 million acres of new land would be placed under water in the next 15 or 20 years, and in the same period supplemental water would be given to about 11 million now inadequately served. While this would by no means provide all the new farm land required by the nation before 1960, it would make a substantial contribution toward the objective.

There are compelling reasons why a large part of the new farm land should be in the West. First, the growing population of the West, as compared with the rest of the nation, demands that agriculture keep pace; and second, the kinds of crops which irrigation farming in the West produces are among those most needed. Irrigated farms produce chiefly, in order of magnitude, forage for livestock, fruits, and vegetables. They cannot economically produce the types of foods in which there have been large surpluses.

Recent estimates indicate that, unless extreme and continuing depression is experienced, western demands for agricultural products are likely to increase between 40% and 65% by 1960. But the West never has produced sufficient food to feed itself, and opportunities for significant food production are limited to irrigated lands. This seems to indicate that the utmost expansion in the production of present irrigated lands will fall far short of requirements. It seems clear that to provide a stable agricultural foundation for the West's increase in population, and to meet the almost certain demand for more food, nothing short of the full program proposed by the Bureau of Reclamation will suffice. It must be remembered that this envisages a development extending over a period of at least 15 years—perhaps 20 to 25 years.

There is one more question that must be answered—and it relates to costs. The irrigation expenditures for our projects are reimbursable. The investment in power producing facilities is reimbursable. The investment in the flood control and navigation facilities of our projects, as is the case with flood control or navigation projects constructed by the Army Engineers, is not reimbursable. That means that the United States is reimbursed for appropriations made by Congress for these projects, exclusive of their flood control and navigation features. The U.S. Government is reimbursed directly through the disposition of water and the sale of hydroelectric power over a period of years.

That part of the construction cost allocated to irrigation is repaid without interest. Power revenues, and consequently rate structures, stated on an annual basis must, under the Federal Reclamation Laws, be such as to return, in addition to the operation and maintenance costs of the power producing facilities (including reserves for replacements), an amount at least equal to 3% of the capital investment in such power facilities, plus such additional amounts as the Secretary of the Interior may deem advisable. Power revenues must also be such as to return, within the repayment period, those costs of irrigation features of Reclamation projects which are beyond the ability of the water users to repay over the statutory repayment period.

Furthermore, the economists of the Bureau of Reclamation have figured that when a project has ripened, it produces crops having an annual value about equal to the total engineering costs for the irrigation allocation. Also, the transportation, processing, wholesaling, and retailing of those crops before they are consumed as food or manufactured as industrial fibers, increases the national income by an amount which is about twice as great as the value of the crops produced on the irrigated farms. Hence, the addition to the national income by irrigation development is about three times the farm value of the irrigated crops.

TAX RETURNS ALSO INCREASED BY NEW RECLAMATION PROJECTS

Now it is obvious that the larger the national income, the larger will be the tax returns to the Treasury. While it is not possible to calculate with exactness what percentage of the additional national income created by new Reclamation projects will be returned to the Treasury, it is clear that the base upon which the calculation must be made is at least three times as large as the value of the irrigated crops on the farm, which equals the investment in Reclamation projects made by the Government. Hence, even if one were to assume that for every additional dollar of national income, the increase in tax returns annually would be at least 5% of this sum, then the annual return in taxes to the Treasury would be at least 15% on the irrigation investment. Bureau economists have calculated that the return in income taxes is considerably greater than this.

What is more, these calculations do not take into account the social gains from an improved standard of living. It should be pointed out also that the purchasing power created by irrigation developments affords a domestic market of large proportions for the products of non-western factories and agricultural crops not produced on irrigated lands.

This is not just a commercial development, but a matter of supporting our ripening culture and preventing it from falling into decay or following in the footsteps of European nations that have reached out for empire to secure food and raw materials. Carried to the ultimate, this is an effort to postpone indefinitely the fate that has overtaken every previous civilization that man has built upon this earth.

I do not think that the proposals of the Bureau of Reclamation alone will salvage our civilization, but I do point out that the part the engineer must play in the future in connection with the regional development and conservation of our natural resources will become more and more important to the general welfare of this nation. The same will be true of every other nation.

The Bureau of Reclamation has been a leader in this field, and, if Congress continues to appropriate adequate funds with which to proceed on the program we have proposed, it will continue to lead. There is a vast demand and future for "resource engineering."

Soil Studies for San Jacinto Dam

By J. NEILS THOMPSON, ASSOC. M. ASCE
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THE San Jacinto Dam is to be located on the San Jacinto River about 20 miles northeast of Houston, Tex. Its purpose is to furnish a supplementary water-supply reservoir for the fast-growing city of Houston. In the design of the structure the characteristics of the foundation soils weighed heavily. Sampling methods used permitted an especially accurate determination of these characteristics. The sampling procedure and analysis of embankment materials are described by Professor Thompson in this article, which is adapted from a paper presented before a meeting of the Society's Texas Section.

HOUSTON, Tex., has for a number of years been getting its domestic and industrial water from ground sources, but increased demands have required the development of new supplies. Several years ago, the City Council adopted a proposal recommended by a local committee, that the surface water of the San Jacinto River be impounded and utilized. A site on the river, several miles above the Southern Pacific Railroad crossing, was selected for a dam, as indicated in Fig. 1. After considerable study of many designs, an earth embankment structure was selected, with a concrete spillway and control gates. Decision as to the general design was not reached until after the foundation investigations had progressed through the preliminary stages. The spillway will be approximately 1,300 ft long and the earth embankment 7,700 ft.

Foundation investigations were started at the site of the dam in the latter part of 1943. Very little was known about the general features of the foundation except that in the flood plain there was approximately 20 ft of sandy material above a clay deposit. It was decided that the preliminary investigation would consist of securing identification cores $2^{3}/_{4}$ in. in diameter. These were taken to an elevation of −160.0. A general sketch of the foundation profile at the center line of the dam is given in Fig. 2. Following the identification coring, 6-in. cores were secured from selected elevations for consolidometer tests. Identification cores were also obtained to points 1,000 ft upstream and downstream from the center line of the dam. The cores along the center line were taken approximately 1,000 ft apart.

FOUNDATION CONDITIONS

The foundation profile indicates recent alluvial deposits in the flood plain. The original deposits, those below the heavy line in Fig. 2, are known as the Beaumont clays, which are found throughout the coastal plains of Texas. The thickness of this layer at the dam site is about 150 ft, and it consists of about 60% clay, 20% silt, and 20% sand. This clay has been described as bluish, yellowish, pinkish, purple, and some shades of red. In most places it is of calcareous composition, and contains calcareous nodules and concretions as well as fragments of more or less decomposed wood. In some sections, fissures occur, which are thin seams of clay of different colors. When broken these appear greasy and shiny.

Above the heavy line in Fig. 2, at an approximate elevation of −25, the materials in the flood plain are recent sedimentary deposits. These clays, which are sometimes termed "varved clays," are similar to the Beaumont clays except that they contain sand seams—very thin and sometimes difficult to identify. Immediately above the clay strata there is a coarse sand from 2 to 8 ft in thickness, then a medium sand, and on top in some areas a sandy clay. The presence of this top layer is favorable, in that it is certain to retard erosion.

On the basis of this information it was decided that the spillway should be located on the top of the clay strata at approximately mean sea level. In order to appraise the foundation further, open pits were put down to investigate the sandy topsoil. Steel liner plates, fabricated for a hole 6 ft in diameter, were used for protection. Well points on 4-ft centers made it possible to excavate to a depth of 18 to 20 ft. Five open pits permitted fairly complete coverage and consistent results. As these pits were put down, samples were secured for permeability, density, and grading tests. The permeability tests, made in the field with a falling-head permeameter, were taken on samples secured in both the vertical and horizontal directions. There did not seem to be much difference between the permeability of a horizontal sample and that of a vertical sample. Because of the rather crude method used to make this test in the field, a pumping test was made, which provided a fair check on the field tests.

UNCONFINED COMPRESSION TESTS

On completion of the open-pit investigation, final coring was started to secure unconfined compression test samples. The City of Houston purchased a coring rig for this purpose and this investigation will be completed in the near future. Results to date are fairly consistent and final designs are being made, subject to the completion of the coring. Unconfined compression tests are being made on $2^{3}/_{4}$-in. samples secured from holes located at intervals of 200 ft along the center line of the dam. The unconfined compression tests are being made in the field immediately after the removal of the samples from the core barrel. The purpose of this investigation is to determine the approximate cohesive strength of the clay strata, the location of the top of the clay, and a detailed foundation profile. In so far as possible, continuous cores are being obtained from each hole.

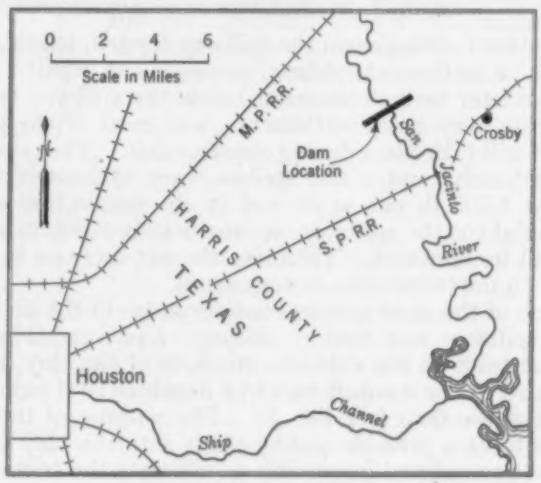

FIG. 1. LOCATION OF SAN JACINTO DAM NEAR HOUSTON, TEX.

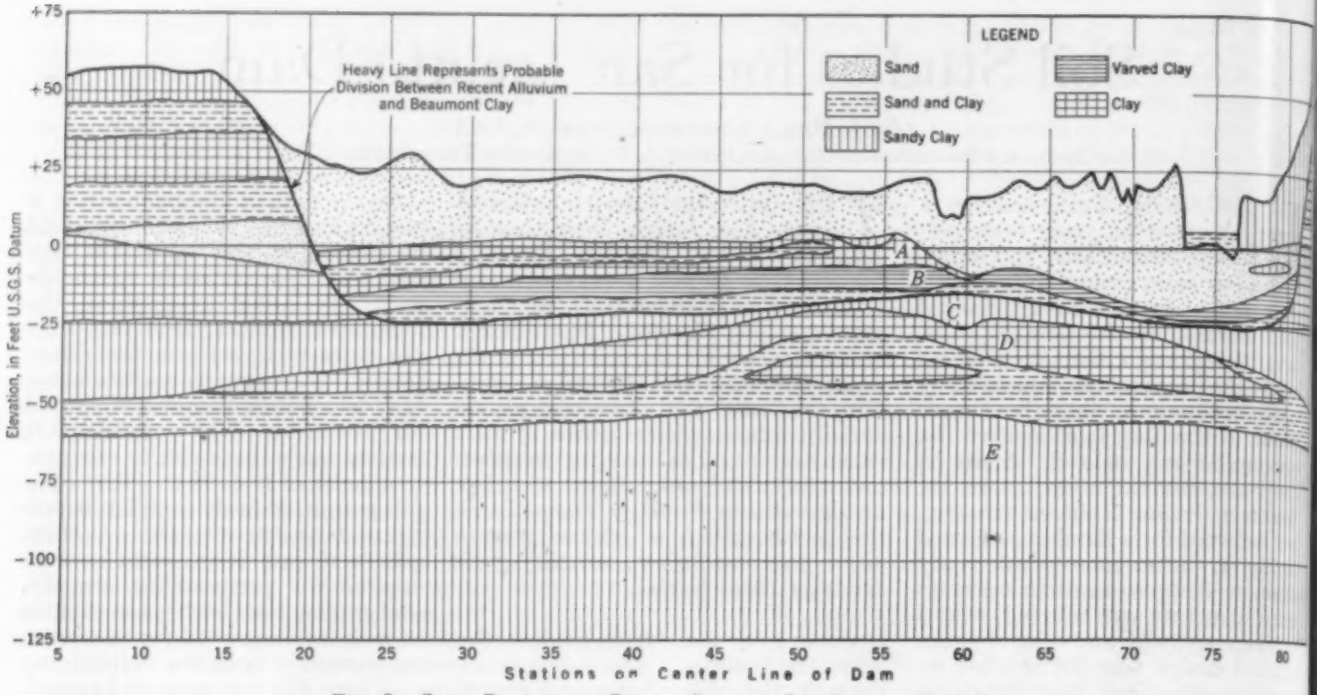

FIG. 2. SOILS PROFILE AT CENTER LINE OF SAN JACINTO DAM SITE

In considering the design of the spillway, the investigation was divided into two parts, the hydraulic study and the foundation study, although the two were related in many phases. (Hydraulic studies have been made at the St. Anthony Falls Laboratory. Here the general designs of the spillway for both high- and low-flow sections were determined.) At the time the open pits were put down, large undisturbed samples were secured from the top of the clay strata for erosion studies.

Under high flows, it is contemplated that the material in the alluvial plain above the dam will erode down to the clay strata. Therefore erosion studies were made on this clay, from which it was estimated that no serious erosion will occur at velocities less than 8.5 ft per sec. These velocities will occur on the upstream side of the dam only when the maximum design flood of 650,000 cu ft per sec occurs. Use of this flood condition for design considerations has been agreed to by the Texas State Board of Water Engineers and the designing board for the dam. It is estimated that this flood will occur but once in several hundred years.

STUDIES OF SPILLWAY FOUNDATION

For the foundation of the spillway section, studies were made of settlement, sliding, seepage, and uplift. Consolidometer tests of material below the spillway section indicate very small settlements, and most of the settlement will take place during construction. The pressures immediately under the spillway are estimated to be about 4,500 lb per sq ft, and in the excavation of the material for the spillway, approximately 2,000 lb per sq ft will be removed. Therefore the net increase in pressure on the foundation is very small.

One of the most serious considerations in the design of the spillway was that of sliding. Upon receiving the initial tests on the cohesive strength of the clay, it was decided to use a cutoff wall to a depth of 10 ft below the base of the dam (see Fig. 3). The purpose of this wall is to force a possible sliding plane into the clay strata. It was considered impossible to estimate the friction between the base of the dam and the clay strata, and it was believed that, even if it were estimated, it probably would not be sufficient to resist sliding of the structure. The shearing strength of a sliding plane in the clay, which could be estimated more effectively, seemed to be preferable. The resistance to sliding was based on an analysis of a failure through a horizontal sliding plane at the base of the cutoff wall to the downstream face of the spillway section, and thence along a passive wedge to an elevation of zero. The cohesive strength required of the clay to resist such sliding is approximately 1,000 lb per sq ft. Tests on the material in this region indicated a factor of safety of $1\frac{1}{2}$ or more.

Not until tests have been completed on the spillway area will it be possible to evaluate this factor of safety more accurately. Because of the existence of the varved clay below the spillway, it is planned to attempt to measure the pore-water pressures in the sand seams during and after construction. It will be some time after construction before horizontal forces will be applied to the spillway; and it is anticipated that the pore-water pressures will have decreased appreciably by that time. Therefore, sliding in a sand seam will be unlikely, but in order to allow for this possibility, only the cohesive strength of the clay is being considered in the factor of safety.

Seepage under this structure will be negligible because of the type of material on which it is being placed. Two rows of steel sheet piling, one on the upstream side in the cutoff wall, and one on the downstream side, will further retard seepage. The purpose of these cutoff walls is to furnish added protection against erosion hazards. A concrete slab will be placed on the upstream side for a distance of approximately 25 ft, and then an articulated mat an additional distance of 25 ft for erosion protection in that area.

UPLIFT PRESSURE CONSIDERED AND COHESIVE STRENGTH OF CLAY STUDIED

A final decision has not yet been reached concerning uplift. One of its effects would be to destroy the friction between the base of the dam and the clay. However, this factor is not considered dangerous because a possible sliding plane will be forced into the clay below

the base of the dam. Uplift will reduce the surcharge on top of a passive wedge immediately in back of the cutoff wall. Present analyses indicate that a maximum uplift would not reduce the surcharge on this wedge sufficiently to cause a failure in this area. A factor of safety against such a failure is several times more than that of a horizontal plane and a passive wedge on the downstream side of the spillway. Uplift will also reduce the normal effective pressure on the sand seams in the varved clay, but this does not seem to be serious either.

Before the results of the unconfined compression tests were secured, some concern was felt regarding a possible base failure in the foundation of the structure, but these tests showed very high cohesive strengths in the clay at elevations below −18.0.

In considering the embankment, serious studies were made of the structure, of seepage, of topping by flood water, and of protection measures. Although some of the analyses have not yet been completed because the final coring has not been finished, it has been possible to estimate the general details of the embankment. As will be noted in Fig. 3, the slope has been set at 1 on 4—one vertical on four horizontal. This flat slope was selected because of the base material. The history of embankments on varved clays is such as to prompt considerable study of this problem. Extensive cores along the embankment sections are being taken and will not be stopped until a very detailed picture is secured of the cohesive strength of the varved clay. On the basis of the cohesive strengths that have been obtained from these cores at the present time, this design appears to be satisfactory, and to have an adequate factor of safety.

TESTING MACHINE SET UP IN THE FIELD FOR MAKING UNCONFINED COMPRESSION TESTS

It is of course realized that this element is hard to estimate and that the most serious time is likely to be during construction. As construction takes place, pore-water pressures in the sand seams of the varved clay will increase sufficiently to reduce the shearing strength of these seams appreciably, and possibly to zero. Therefore the resistance of this material to shearing is being considered only as the cohesive strength of the clay. It is contemplated that every precaution will be taken, including the use of the pore-water pressure cells and observations on the embankment (both vertical and horizontal) to insure the safety of the structure. A composite sliding surface that cuts down through the impervious section into the top alluvial sand, thence into the varved clay strata, and thence to a passive wedge at the edge of the embankment, was considered as the critical condition.

The seepage through and below the embankment will be controlled by an impervious section and a steel sheet-piling cutoff wall into the clay strata. In addition to these controls, a sandy clay covers the alluvial plane. Estimates of seepage without a sheet-piling cutoff were small, particularly because of the sandy clay topsoil. This condition varies throughout the length of the embankment, especially in the area adjacent to the present stream bed. It was considered desirable, therefore, to put a row of sheet piling throughout the length of the embankment and tie it into the cutoff wall in the spillway section.

Because of the very high maximum design flood and because of its low frequency, it is considered that a freeboard of 7 ft will be adequate. This flood will have only a short duration. Under normal pool operations, the freeboard of $17\frac{1}{2}$ ft will be more than adequate. Embankment protection on the upstream side will be a 6-in. concrete slab; on the downstream side it will be topsoil with sod.

This dam is being planned by the City of Houston. The designing board consists of J. M. Nagle and G. L. Fugate, respectively director and chief designing engineer for the Utilities Division of the City of Houston; W. W. Horner, M. ASCE, consulting engineer of St. Louis, as general consultant; Lorenz G. Straub, M. ASCE, head of the St. Anthony Falls Laboratory, University of Minnesota, as hydraulic consultant; and the writer as soil mechanics consultant. (Mr. Nagle recently became City Manager of the City of Houston.)

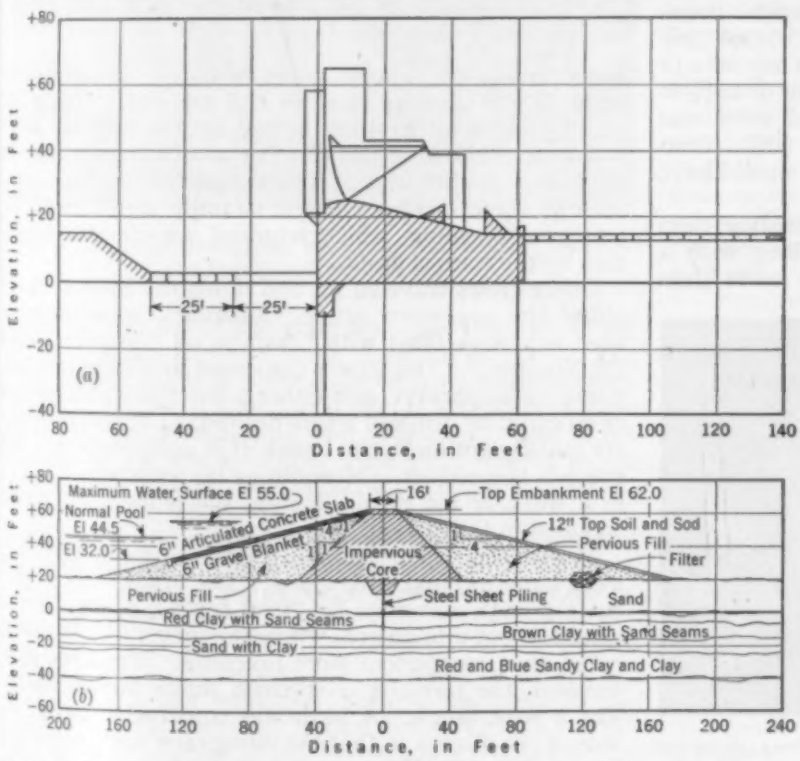

FIG. 3. SECTION THROUGH SAN JACINTO DAM: (*a*) SPILLWAY, (*b*) EMBANKMENT

Malaria Control in Assam

By ROBERT S. WILMOT, JUN. ASCE
STAFF SERGEANT, A.U.S., FORMERLY WITH 123RD MALARIA CONTROL DETACHMENT

CONTROL of malaria by Allied forces during World War II has involved the use of extensive forces, equipment, and constant vigilance. It has been one of the few wartime operations which have benefited civilian populations of occupied areas. Relative effectiveness of control methods provide lessons for public health officers in civilian as well as military agencies. In this article Sergeant Wilmot describes the experience of one control unit, indicating in general the methods used in all malarial zones.

EARLY experience in this war, gained chiefly in the South Pacific, showed that if the Anopheles mosquito were not controlled the malaria rate among our troops might be 75%, 85%, or over 90% of our total strength in the highly malarious districts. To combat this mosquito menace, the Army, under the jurisdiction of the Surgeon General's Office in Washington, set up two types of units, the Malaria Survey Unit and the Malaria Control Unit.

Survey units enter an area first and determine the incidence of malaria. They take water samples and note the presence or absence of Anopheles mosquito larvae or pupae. Survey units also take blood smears and spleen tests of the children in the locality. It has been found that an accurate yardstick of malaria incidence in an area may be determined by the number of enlarged spleens in children under a certain age. The survey unit's personnel consists of 11 enlisted men and two officers, one an entomologist and the other a parasitologist. Closely on their heels comes the control unit, which does the follow-up work on mosquito eradication. Control units also contain 11 enlisted men, but only one officer, a Sanitary Corps officer.

India has long been known as a very malarious country. And Assam, where the 123rd Malaria Control Unit was initially sent, has about as high a rate as any area in India. Malariologists say that a spleen rate of 25% is considered high. In Assam, before control work was started, the spleen rate was consistently over 90%. Consequently, any reduction in the malaria rate should have been easy to note.

However, results were more difficult to analyze than had been expected. The unit operated along with a similar unit that had been on the job for more than twenty-four months. This arrangement, called parallel training, is the best method of learning the existing conditions and control practices. Chief interest was in the malaria rate among American troops, which was readily obtained from the Medical Units. The rate among the natives, which was actually the governing one, was almost impossible to get.

BLOWER-TYPE DUSTER DISTRIBUTED POWDERED DDT OVER BREEDING PLACES

Control work was divided roughly into five operations:

1. Drainage, where feasible, of stagnant water areas;
2. Where drainage was not feasible, the oiling of these areas;
3. Stream clearance, channel straightening and widening;
4. Dusting with DDT powder or with paris green;
5. DDT spraying.

For drainage operations, crews of native laborers were employed to open up marshes and swamps. This work was hindered rather than helped by the military road builders. Their accepted practice was to drain highways with large ditches leading into the jungle. During rainy seasons these ditches created swampy areas, ideal for mosquito breeding, which required considerable attention by the control units.

Oiling crews traveled up and down the Stilwell Road oiling the necessary areas. Knapsack sprayers were used and were filled with "malaria oil," usually Diesel Oil Number 2. The oil was dispensed by a hand pressure pump in the sprayer, and either a fine spray or a stream of oil could be directed where desired. The native workers quickly got on to the knack of it and pretty well ran the job themselves. Mosquitoes lay eggs which hatch in a week or ten days. Hence, the oiling cycle corresponded to this period.

Stream clearance, channel straightening and widening, went hand in hand with oiling. The brunt of all brush-cutting work was done by about forty laborers. These would be put into an area where the survey unit had indicated that mosquitoes were breeding. When the crew finished, the formerly overgrown jungle stream looked like a park brook. A path was constructed along one side of the stream so that the oiling crew could easily get in to oil it. Bridges were constructed as well as steps. Tablets out of mud were erected indicating to the world

MOSQUITO BREEDING PLACES WERE THOROUGHLY SPRAYED IN THE MALARIA CONTROL CAMPAIGN
This Knapsack Sprayer Is Spreading DDT in Solution

in general, and to the animals in the jungle in particular, that this "Work done by Gang Number 2, Travancore State Labor Unit Number 80 was completed May 7, 1945. LEDAR ALIAR KUNJU." These laborers, called Malayalums, took great pride in doing a piece of work that looked presentable.

There was practically no dusting with paris green or DDT dusting powder in this section. Paris green was unobtainable and DDT was nearly as scarce. Other control methods proved satisfactory, so dusting was deemed unnecessary in this area. DDT spraying has perhaps been more advertised than any of the other control methods. The control unit carried on its spraying in a manner similar to its oiling, that is, on a regular schedule. Four weeks elapse between the first and second applications of the spray. Two months after the second spraying, the job is repeated, and thereafter it continues on a two-month schedule.

In the hope of killing any insects which might have been brought in on planes from an infected area, all planes landing in the area were sprayed with DDT.

Some areas of India adapt themselves very well to airplane spraying or dusting. The area covered by Unit 123, however, was one of heavy and vast jungles, where it was very difficult to utilize air spraying. Hence none of it was done, although a plane was available.

In upper Assam, only a few miles from the India-Burma border, the control area was made up of vast plains and even more vast jungles. Clearing crews found it an uphill task to keep ahead of nature. A crew would go through a stream, leaving it nicely channeled, brushed, and with a walkable path along its control length. A

NATIVE VILLAGES BENEFITED FROM THE EXTENSIVE SPRAYING PROGRAM NECESSARY

month later it would find grass and weeds growing in the streams, fallen bamboo trees, dammed up pools, etc. Natives and GI's, in need of wood, cut whatever they wanted. A cleared stream bed offered an excellent place to cut off the piece needed and to leave the rest in the stream. Then again, clothes were often washed in the streams and so dams were constructed to provide a suitable supply of water. Occasionally one of our own installations would get its drinking water from a stream and so would dam it up to produce a sump from which to draw. So although nature combated the control units, man did his part too.

Proper malaria discipline is taught to all American troops in malarious regions. Despite this, or maybe because of so much emphasis, malaria discipline in the field is very lax unless it is kept before the GI's at all times. Most soldiers do not like repellent. They do not like to roll down sleeves and put on shirts at dusk. They

HIGHWAY DRAINS CARRIED HEAVY RAINFALL OFF TO ADJACENT SWAMP AREAS, INTENSIFYING THE CONTROL PROBLEM

do not like mosquito bars (bed nets). Atabrine has a very bitter taste and is also unpopular for another reason. A legend has sprung up that it results in sterility, which is altogether false but makes atabrine discipline very difficult indeed. However, as it is the individual commanding officer's responsibility to see that the rules are adhered to, he sees to it that the prescribed procedures are carried out. Even though this is done to the letter, however, there is no absolute guarantee that malaria will be thwarted, although ninety-nine times out of one hundred the men will be protected from the disease.

Indian troops are given their daily atabrine or substitute at a formation after their evening meal. The noncom in charge receives from the commanding officer the exact number of pills required. He then administers them to each man individually and does not move on till the man has swallowed the pill. We rely more on the honor method for our soldiers.

Objective of the control unit is that breeding of mosquitoes be eliminated within a one-mile radius of any and all installations. This applies to Army as well as native dwellings. In fact, the control of native areas is of more importance as it is from these places that most malaria emanates. Each control method has its own value. But none is sure fire. Therefore any and all control measures which are feasible are used. In addition to control of mosquito breeding, Army living quarters are required to be mosquito proofed. Aerosol bombs which contain insecticide capable of killing mosquitoes and flies immediately, are issued and used. The control unit sprays DDT on all living dwellings, mess halls, barracks, tents, kitchens, latrines, Red Cross Halls, native villages, native tailor shops, Indian army camps, labor camps, etc. So the Anopheles is up against a tough fight for existence.

Malaria control work on the whole progressed effectively and efficiently. Cases of malaria were considerably under the number expected. Summarizing the scope of the control compaign, the official Army C.B.I. publication *Roundup* recently editorialized, "Many of us in the Army owe our lives to the constant vigilance of these men and their survey and control units. It is very likely that the Jap might still be astride the life line to China if it weren't for them and their work." This is a fitting tribute to one of the less known but vitally important battles of World War II.

Vibration Studies on Steel Towers of Boulder Transmission Lines

By JOHN K. MINASIAN, JUN. ASCE
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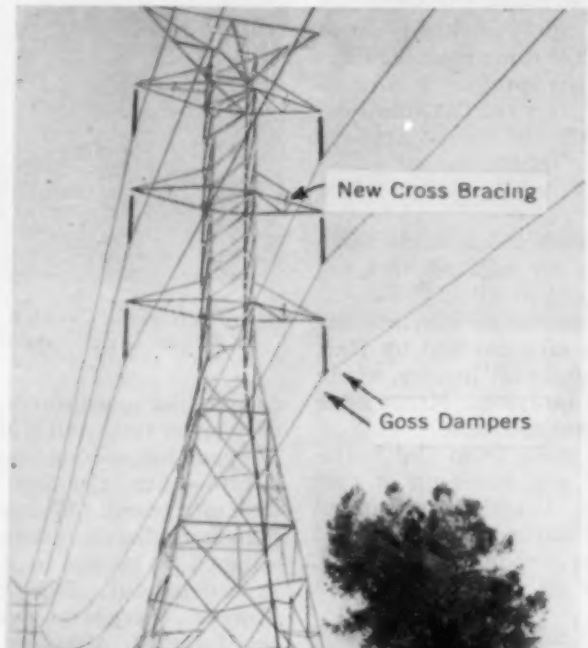
FIELD observations by line patrolmen working on the steel towers of the 287,500-v Boulder transmission lines of the City of Los Angeles, Department of Water and Power, disclosed a number of failures of tension members supporting the ends of the cross arms on the towers. The failures took place with development of cracks through the steel adjacent to bolt holes in the ends of the members. To determine the cause of failure, vibration studies extending through a period of one year were made on the towers by the structural engineers of the Department of Water and Power.

The first and second circuits of the Boulder transmission line consist of two sections, the first 230 miles being single-circuit through mountainous and desert country from Boulder Canyon to a point west of Cajon Pass, and the last 40 miles double-circuit from there to Los Angeles. The steel transmission-line towers vary in height from 109 to 144 ft and are spaced about 1,000 ft apart in the single-circuit section, and about 900 ft apart in the double-circuit section. On single-circuit towers, the distance between phases or conductors is 32½ ft, and the height to the cross arms is 90 ft. The towers are designed against one broken conductor, one broken ground wire, ½ in. of ice on the conductor, and an 8-lb wind.



TOWER ON WHICH TESTS WERE MADE

FIELD INVESTIGATION MADE

Field studies were made to determine the causes of failure of the tension members. One of the towers investigated was a double-circuit suspension tower (Tower 260-D-1). Studies were made to show the duration of vibration of the tension members, the effectiveness of the auxiliary cross bracing in preventing the vibration of the tension members, and the effectiveness of the conductor dampers in damping the vibration forces transmitted to the cross arms.

This tower is situated on the east bank of the Rio Hondo River near Firestone Boulevard in Los Angeles. It was chosen for the field studies because it is in a vicinity where there are many damaged cross-arm tension members. Two types of instruments were used to measure the amplitude and duration of vibration at various points on the cross-arm members. Both types consist of a clock mechanism which rotates a wax chart, upon which a stylus traces the amplitude and duration of vibration.

The first type of instrument used was the direct-acting type. By means of piano wire, the stylus of this instrument moves directly with the point on the cross arm being investigated. The second type of instrument is the inertia type, which makes use of the principle of an inertia arm as used in a seismograph. Theoretically, the amplitude and duration of vibration at any point could be found by fastening this instrument bodily to the point being investigated. However, field observation showed that the inertia-type instrument could not be relied upon to record the amplitude of vibration although it did give an accurate measure of the duration of vibration during the period of the test.

The inertia-type instrument was used to measure the duration of vibration at the ends of the cross arms and at the midpoints of the tension members supporting the ends of the cross arms. These instruments were clamped to the cross arms at points where measurements were desired. Simultaneous records were made of the vertical component of vibration at the following points:

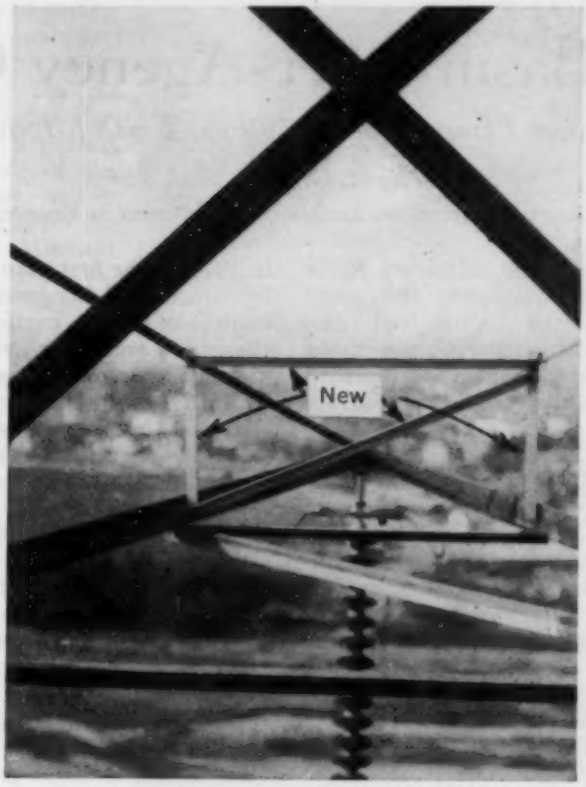
1. Midpoint of tension member, west circuit, bottom cross-arm
2. Midpoint of tension member, east circuit, bottom cross-arm
3. Midpoint of tension member, east circuit, middle cross-arm

The records taken at these three positions were identical.

To compare the effectiveness of the conductor vibration dampers, and of the auxiliary cross bracing for the cross arm in preventing the vibration of the tension members, simultaneous records of the midpoint of the tension members were obtained thus:

1. Without either auxiliary cross bracing or conductor vibration dampers;
2. With
   - (*a*) the west circuit, bottom cross-arm in the original state before the vibration studies were started
   - (*b*) the east circuit, bottom cross-arm, with the conductor dampers installed
   - (*c*) the east circuit, middle cross-arm, with the auxiliary cross bracing installed

Results, when compared, indicated some reduction in the amplitude of vibrations where the conductor dampers had been installed, and considerable reduction of vibration where the auxiliary cross braces had been placed. To find the magnitude of the vibration more accurately, the direct-acting instrument was installed at the midpoint of a cross arm where neither dampener nor cross bracing had been installed. This instrument also recorded the actual wave pattern of the horizontal component of movement of the midpoint of the tension member. The wax chart was rotated manually at a rate such as to secure a separation of wave patterns.



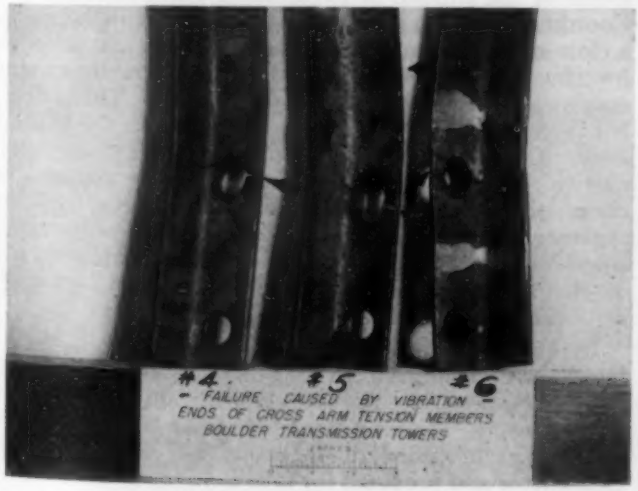
NEW BRACING IN PLACE ON TOWER CROSS-ARM

VISUAL OBSERVATIONS

The following visual observations were made at close range at Tower 260-D-1 (shown in a photograph):

1. Of the two tension members supporting the end of the cross arm, the slack tension member, or the tension member not carrying its half of the load, is the one whose midpoint showed the greater amplitude of vibration.

2. One quiet morning the conductor started to vibrate at a frequency such as to induce resonant vibration in the tension members supporting the cross arms. Of the two tension members, the slack member started vibrating violently and its undulations, or its vibration beats, approximated those of the conductor. This vibration motion was sustained for about ten minutes, after which time the conductor and the tension member became absolutely quiet. After a lapse of about 15 minutes, the conductor started vibrating again, but at a higher frequency and at a higher energy dissipation. This time the tension member showed no vibration because its fundamental frequency was non-resonant with the new vibration period of the conductor.



TYPICAL FAILURE OF TENSION MEMBERS ON TRANSMISSION TOWERS AT BOLT HOLES

Examination of tension members on other towers showed that most of the cracks occurred at the lower ends of the angle member at the second bolt hole. On some members the crack extended entirely through the leg containing the bolt hole and three-quarters through the outstanding leg. On an accompanying photograph arrows outside the specimens point to the beginning of a crack, and arrows on the specimens show the end of a crack. In all cases, the failure sections showed no reduction of area of the metal. The tension members that failed were 10 ft or more in length and without mid-braces.

SYMPATHETIC VIBRATION

The field studies show that conductor vibration caused the tension members of the cross arms of both dead-end and suspension-type towers to vibrate violently. Mathematical studies show that tension members with unsupported lengths of over 10 ft have a natural fundamental frequency comparable with that of the conductor. Most of the cross-arm tension members are $1\frac{3}{4}$ by $1\frac{3}{4}$ by $\frac{3}{16}$-in. angles. For a conductor vibration of 5 cycles per sec, a $1\frac{3}{4}$ by $1\frac{3}{4}$ by $\frac{3}{16}$-in. angle, having a length of 21 ft 5 in. between bend lines, would be in resonance, whereas a length of angle of 10 ft 8 in. would be in resonance with a conductor vibration of 20 cycles per sec.

Efforts were made to secure simultaneous records of conductor vibration and tension-member vibration, but records could not be secured of the conductor because the transmission line could not be put out of service long enough. However, previous records of typical conductor vibration, compared with the recorded wave patterns of the midpoint of the cross-arm tension member, indicate similarity between the two. While the field observation of tension members unsupported at their midpoints, having lengths of over 10 ft, has shown failure cracks at the bolt holes, no failure of tension members under 10 ft long has been reported.

All cross-arm tension members cracked or damaged by wind were replaced and auxiliary cross bracing installed so as to reduce the unsupported length of the tension members. The cross bracing consisted of salvaged $1\frac{3}{4}$ by $1\frac{3}{4}$ by $\frac{3}{16}$-in. angles. On each tower having one or more cracked tension members, these damaged members were replaced and cross bracing was provided. The rest of the cross-arm tension members on the tower, of the same length as the damaged ones, also were cross braced. It was recommended that Goss vibration dampers be installed on conductors in vicinities showing many cracked tension members.

The vibration studies were made under the supervision of William S. Peterson, assistant chief electrical engineer, and G. E. Benkesser, engineer of design and construction. The direct supervision was under William A. Hunsucker, M. ASCE, senior structural engineer, Los Angeles Department of Water and Power.

Missouri Basin Inter-Agency Committee

Control of Missouri River Planned Jointly by Four Federal Agencies and State Officials

By R. C. CRAWFORD

BRIGADIER GENERAL, CORPS OF ENGINEERS, ASSISTANT TO THE CHIEF OF ENGINEERS, WASHINGTON, D.C.

FOR countless ages the turbulent Missouri River has held almost unbridled sway in the great basin which it drains. For the last hundred years it has been a destructive force which the people of the valley have attempted to curb in piecemeal fashion with earth dikes and revetments, many of which the river has promptly swept away.

Not until recent years has the flood menace in the valley been recognized as a problem to be combated by federal laws and agencies. The Flood Control Act of 1944 set up a coordinated, multiple-purpose plan to harness the mighty stream and make it work for man instead of destroying his prosperity and endangering his safety year after year.

A vital factor in the carrying out of this vast program is unified action by the federal agencies that have been directed by Congress to do the job. To insure unified and integrated functioning, the Missouri Basin Inter-Agency Committee was created in March 1945.

To understand the purpose and function of this committee, it is necessary to review briefly the history of the legislation which authorized the development of the water resources of the Missouri River Basin.

Two plans were developed for the Missouri River Basin—one submitted in 1943 by the Corps of Engineers, and the other completed by the Bureau of Reclamation in 1944. The first plan (that of the Corps of Engineers) by direction of Congress had for its primary purpose the control of floods, particularly in the lower valley, with the use of water for irrigation, navigation, the development of hydroelectric power and other corollary benefits as incidental to the primary purpose. The second plan (that of the Bureau of Reclamation) was approached from the irrigation angle and had for its primary purpose the utilization of the waters of the Missouri River Basin for irrigating the semi-arid portions of the basin lying generally west of the 98th meridian.

MISSOURI RIVER NEAR BROWNVILLE BEND, NEBR.
Above, Partially Completed Dike System; Below, Same System 5½ Years Later, with Willow Growth in Upper Center, and Well-Defined Channel at Upper Left

Extensive hearings were conducted on these two plans before committees of the House of Representatives and the Senate. It became evident early in these hearings that the two plans, although approached from different angles, were not very far apart in their engineering and physical aspects. The controversy over the two plans revolved around a matter of water policy. The central question was: Should the use of water for irrigation and other beneficial consumptive uses in the arid and semi-arid sections be given priority over the use of water for navigation?

In October 1944, while this matter of policy was still being argued in the committees of the Senate, the Commissioner of the Bureau of Reclamation and the Chief of Engineers directed their field agencies to get together and coordinate the engineering features of the two plans so that they both could be enacted into law without conflict. This coordination was effected at a meeting of the field representatives of the two agencies in Omaha, Nebr., October 16–17, 1944. The plans as thus coordinated were approved by Congress and enacted into law in the form known as the Flood Control Act of 1944, which was approved on December 22 of that year.

Coordination of these plans by the two agencies concerned was a natural outgrowth of a cooperative agreement between them which had been in effect since July 1939. In this agreement, known as the Tripartite Agreement, the Chief of Engineers, the Commissioner of the Bureau of Reclamation, and the Land Use Coordinator of the Department of Agriculture agreed to a close coordination of their field activities and provided for the exchange of data and information to prevent overlapping of their activities in the field. This Tripartite Agreement was later extended to include the Federal Power Commission, and become known as the Quadripartite Agreement. In order to make the cooperation closer, the four agencies decided, in December 1943, to organize a committee for the discussion of problems of coordination. Since that date this committee, known as the Federal Inter-Agency River Basin Committee, has held monthly meetings in Washington, D.C.

In March 1945 the committee recognized the need for closer coordination on the ground, and closer contact with the states, in the development of the Missouri River Basin. It therefore, by resolution dated March 29, 1945, established the Missouri Basin Inter-Agency Committee and provided for it to hold meetings in localities in the basin. The purpose of this committee was stated by the resolution to be: "To implement the

policies of the Federal Inter-Agency River Basin Committee by providing a means through which the field representatives of the participating Federal agencies may effectively interchange information and coordinate their activities among themselves and with those of the States in the preparation of reports and in the planning and execution of works for the control and use of waters of the Missouri River Basin."

The resolution provided that the committee should consist of four federal members and two representatives from the Missouri River Basin. The four federal members were designated as representatives of the Corps of Engineers of the War Department, the Department of the Interior, the Department of Agriculture, and the Federal Power Commission. The Washington committee, by letters to the governors of the ten Missouri Basin states, requested them to act jointly in naming the two basin representatives. This number was later increased to four on the request of Governor Sharpe of South Dakota, acting for the Missouri River States. The committee therefore now consists of: Maj. Gen. Lewis A. Pick, Corps of Engineers (succeeding Brig. Gen. R. C. Crawford); H. D. Comstock, M. ASCE, Department of Interior; A. E. McClymonds, Department of Agriculture; B. H. Greene, Federal Power Commission; Phil M. Donnelly, Governor of Missouri; Dwight Griswold, Governor of Nebraska; Sam C. Ford, Governor of Montana; Lester C. Hunt, Governor of Wyoming.

The four federal members represent agencies which are recognized as expert, not only in this country but abroad, in the techniques required for the full and comprehensive utilization of water resources. The four representatives from the states, who represent the interests of the basin as a whole, may properly be considered as experts in their knowledge of the interests and desires of the people of the basin. They bring to the committee a broad knowledge of popular government and democratic procedures as regards the interest of the private citizen. They bring to bear on the engineering problem the factors of human relations, which so often have a determining effect on decisions. It is believed that this is a most advantageous combination, as the experts in the technical field are balanced by experts in human relations.

WORK AT ROCK BLUFF BEND, NEBR., ON MISSOURI RIVER
Above, Uncontrolled River at Start of Diking; Below, Completed Right Bank Dike System About 16 Months Later

In addition, the four state governors on the committee have their own technical staffs within their respective states, which they can consult prior to committee meetings and have present with them at such sessions. Furthermore, when a project specifically affecting one or more states is up for discussion at a committee meeting, the basin representatives are expected to bring with them such officials and advisers from that state or states as are considered necessary for a complete presentation of the interests concerned. In this way the committee gets before it not only the basin-wide viewpoint of the problem but the viewpoint of the state intimately concerned with it.

The committee has had only six meetings, the first two having been held in Omaha on July 19 and August 16; the third in Billings, Mont., on September 20; the fourth in Pierre, S.Dak., October 18; the fifth in Denver, Colo., on November 17; and the sixth in Cheyenne, Wyo., on January 17.

Naturally the committee is still in the process of getting acquainted with the vast problem that confronts it. However, experience thus far proves that it is capable of positive and prompt action when that is demanded, and leaves no doubt that it can efficiently coordinate the activities of the various federal departments with the interests and activities of the states in the prosecution of the work now authorized by Congress. The committee is not an authority and makes no pretense of being. In its philosophy the accent is on its responsibility to the people in whose interests Congress approved the plan for the development of the Missouri River Basin.

DIKE MATTRESS BEING SUNK TO RIVER BED WITH STONE BALLAST
Later Piles Will Be Driven Through Mattress

Design of Bridges Against Wind

V. Criteria for Assuring Aerodynamic Stability

By D. B. STEINMAN, M. ASCE

CONSULTING ENGINEER, NEW YORK, N.Y.

THE magnitude of the problem of aerodynamic stability has been outlined in previous articles. In this, the last installment, Dr. Steinman tells how to determine when a design is such that the bridge will be adequately or assuredly stable. For this purpose he gives two specifications for structural adequacy and three criteria of increasing accuracy for guiding the design.

IN a notable memoir (published in 1856 in London) describing his completed Niagara Railway Suspension Bridge and illustrated with his own drawings, John A. Roebling proclaimed a principle unknown to his predecessors and unrealized by most of his successors—namely that:

Suspension bridges can be built to any desired degree of rigidity.

And, with keen insight, he posed the basic question—one that has challenged bridge engineers to this day: How rigid do spans need to be made?

Roebling's sublime and prophetic faith in the suspension type of construction, in which he pioneered and achieved when others doubted, stands recorded in his final report (1867) on his great span over the Ohio at Cincinnati: "It is in large spans where the principle of suspension will forever stand without a rival, no matter what novelties may turn up in the future. Within the whole range of engineering, no system of construction presents such favorable conditions as are offered by the suspension system. Fully aware that opposite opinions are taught in textbooks on engineering, I know that I am exposing myself to criticism, but I also know that the future history of engineering will do me full justice."

Again, in his classic report (1867) describing his completed plans for the Brooklyn Bridge, Roebling clearly showed how he had applied the cumulative wisdom of all his prior contributions to the art so as to secure rigidity and stability in a measure never before attained. Then he added: "If a rigid economy was to be exercised for want of capital, less strength and stiffness might answer. By a reduction of weight and of strength, a great deal of expensive material and work might be saved. But in the same proportion would the stiffness of the work be also decreased, and its safety in the case of a great hurricane less insured." Three-quarters of a century before other bridge engineers learned the lesson, Roebling's clear thinking had crystallized the basic principle governing the economy and rigidity of suspension designs—namely, that any desired degree of stiffness can be secured if one is willing to pay for it and, conversely, that excessive economy in first cost may mean dangerous reduction in aerodynamic stability.

Without special thought to improving the aerodynamic characteristics of the cross section, and without the aid of other means of stabilization or stiffening, aerodynamic stability can be secured by simply providing adequate depth of stiffening trusses or girders. As a first criterion to apply, the writer, by analysis and statistical comparison, has established the following simple specification:

> *Specification 1:* The depth of stiffening girders or trusses shall be not less than $l/120 + (l/1{,}000)^2$, unless aerodynamic stability is otherwise assured.

By this first test, the required depth ratio of d (depth of girder) to l (length of span) ranges from 1/120 in very short spans, to 1/100 for spans between 1,000 and 2,000 ft, and to 1/80 for spans longer than 4,000 ft. This reverses the prior concept that the longer spans require little or no stiffening. The indicated girder depth for the longer spans is not economically attractive, but is necessary unless the deficient rigidity and structural damping are supplied in other ways, or unless an aerodynamically stable design is otherwise assured.

In suspension bridges with more generously proportioned stiffening trusses (as in those designed for relatively heavier live loads and in those proportioned by the older "elastic theory"), a shallower depth ratio will yield the requisite stiffness and damping. If the foregoing first criterion is not satisfied, the next test to apply, which involves the dimension b, or width of the bridge, is the writer's more general specification:

> *Specification 2:* The stiffening system of a suspension bridge shall have a value of EI of not less than $bl^4/120\sqrt{f}$, unless aerodynamic stability is otherwise assured.

Incidentally, this relation shows that to augment rigidity by reducing the cable sag f (as was done for economy in the Tacoma Bridge) actually impairs aerodynamic stability.

If the foregoing tests (Specifications 1 or 2), easily applied, are not satisfied, a more intimate examination of the aerodynamic constants of the structure is required. Any deficiency must be made up by special provisions or corrected by special design.

The most important constant in aerodynamic studies for any structure is the "spring constant" or coefficient of rigidity K. It measures the resistance to oscillation and determines the frequency of harmonic oscillation in any mode. The numerical value of K can be easily and accurately calculated for any existing or proposed structure of known dimensions. The mode, $n = 2$ (the main span oscillating in two segments with a node at mid-span), is most conveniently used for calculating K, since the fundamental mode, $n = 1$, will rarely give a value materially lower. For all even values of n (the "antisymmetric" modes), K is given quickly, scientifically, and accurately by the writer's simple formula,

$$K = \frac{\pi^2 n^2}{l^2} H + \frac{\pi^4 n^4}{l^4} EI \quad \ldots\ldots\ldots\ldots (1)$$

in which H is the horizontal component of dead-load cable stress. This value of K for $n = 2$ ranges from 62 in the ill-fated Tacoma span to 1,082 in the Williamsburg Bridge. Low values of K are associated with aerodynamic instability; but K alone does not tell the whole story.

It should be noted that in the writer's formulas all the related constants (H, I, K, w) are per cable or truss, that is, per half-width. If these constants are taken

FLORIANAPOLIS BRIDGE IN BRAZIL, LONGEST EYEBAR SUSPENSION SPAN IN THE WORLD (1,114 FT)
Novel Stiffening System Secures High Degree of Rigidity

per bridge (full-width), the writer's criteria are easily modified to correspond—that is, by using 60 instead of 120 in Specification 2, 1,200 instead of 300 in Criterion 1, and 10 instead of 5 in Criterion 2.

The two terms in the formula for K (the H term and the EI term) represent the contributions of the cable and the stiffening girder, respectively. The ratio of the girder term to the total is the stiffening ratio R, and largely determines the structural damping. The value of R ranges from 0.015 in the collapsed Tacoma span to 0.780 in the Williamsburg Bridge. Low values of R are associated with aerodynamic instability. (If other means are used to supplement the stiffening provided by the girder, the corresponding contributions to K are included with the EI term to obtain the augmented R.)

Another important dimensional constant is the width factor B $(= b^2/w)$, in which w is the weight of the span per linear foot. Aerodynamic instability increases with the square root of B. The value of B (with w per half-width) is fairly constant at approximately 0.4 to 0.6 for most suspension bridges. For wide bridges of normal or reduced weight per square foot, the value of B may be doubled, as in the Bronx-Whitestone Bridge, thereby adding 41% to the instability. Contrary to popular misconception, the narrowness of the Tacoma Bridge was not the cause of its failure. If the bridge had been wider, it would have been more vulnerable to aerodynamic action, with more rapid amplification and greater amplitudes; and its instability would have been more difficult to counteract or cure.

Almost any bridge cross-section has an inherent tendency to be aerodynamically unstable at some ranges of wind velocities. Whether the span will or will not be aerodynamically stable depends upon the balance of two factors: (1) the amplifying factor (negative damping, δ) contributed by the wind, adding energy and tending to amplify the slightest initial tremor into bigger and bigger motions; and (2) the positive damping factor (δ_s, provided by the hysteresis loss in the internal work of the elastic strains, energy loss in rivet slip and friction, atmospheric damping, etc.), dissipating or subtracting vibration energy and tending to reduce any motion to smaller and smaller amplitudes.

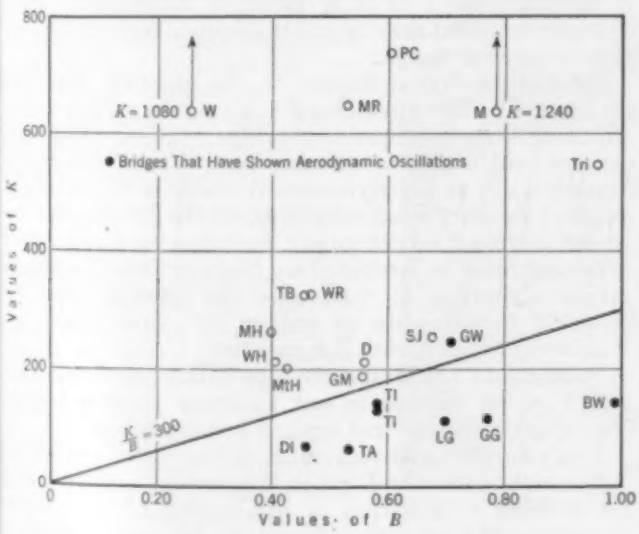


FIG. 1. RELATION BETWEEN K AND B FOR LARGE SUSPENSION BRIDGES

Symbols Refer to Names of Bridges, as TB, Transbay; MH, Mid-Hudson

A span which draws vibration energy from the wind faster than the structural and other positive damping can dissipate it, will be aerodynamically unstable. Any small initial motion will be amplified, and sometimes (if the net input represented by $\delta - \delta_s$ is high) at a startling rate. The amplification is logarithmic, like geometric progression or like a steep rate of interest per oscillation, compounded at each oscillation. The slightest tremor may thus be multiplied a thousandfold in a few minutes. In the reverse case, if δ_s exceeds δ, any initial motion of the span, instead of being built up into amplified oscillations, will be damped and soon brought to rest, just as a vibrating piano wire or tuning fork comes to rest by dissipation of energy.

Positive damping, opposing or nullifying potential aerodynamic instability, includes hysteresis damping, friction damping (structural or artificial), passive atmospheric damping, and augmented atmospheric damping due to wind velocity. Subject to confirmation or adjustment of the present indicated basic coefficients, all these factors have been formulated by the writer and can be predictively computed. If the total positive damping is known, together with the aerodynamic characteristics of the section, the critical wind velocities at which aerodynamic instability may appear can be precalculated—as can the potential amplitude response at any specified higher velocity.

To increase the dead load, without reducing the depth and section of the girders or trusses, will produce a small improvement in aerodynamic stability, which may be outweighed by the resulting reduction in atmospheric damping. If advantage is taken of the increased dead load to reduce the girder section (by the deflection theory), the coefficient of rigidity K will remain unchanged and (with the reduction in R and in positive damping) the aerodynamic stability will be materially reduced. Hence, contrary to past emphasis, dead weight is not a complete substitute for stiffening. The use of a lighter floor construction, if the necessary corresponding increase is made in the girder section, will actually improve aerodynamic stability by a substantial and easily calculable amount.

The basic information for predetermining potential aerodynamic stability, both in sign and in intensity, is supplied by the static lift graphs and torque graphs. These graphs are known or can be predicted for conventional sections and, for unusual sections, can be secured by simple wind-tunnel tests on a stationary section model. By the writer's graphs, the wind-tunnel characteristics of an H-section can be predicted from the section-ratio d/b in the case of solid girders, and from the equivalent section-ratio in the case of open trusses.

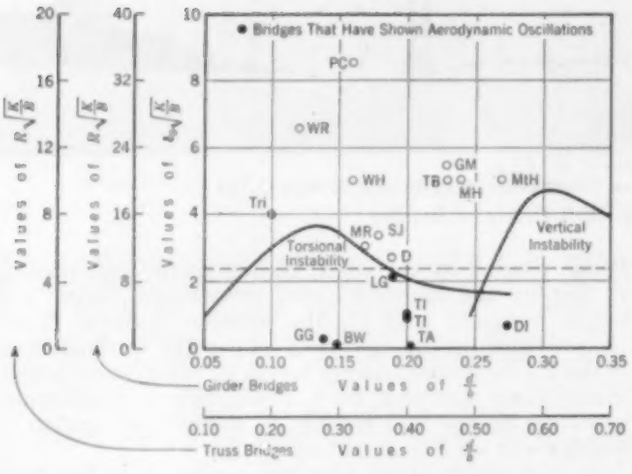


FIG. 2. GRAPH OF AERODYNAMIC STABILITY, CRITERION 2, FOR A WIND VELOCITY OF 100 MILES AN HOUR

Bridge Names Abbreviated, as WR, Wabash River; WH, Waldo-Hancock

Potential vertical and torsional instability may be minimized or eliminated by using: (1) optimum section ratios; (2) sections yielding lift and torque graphs of very flat slope; (3) vertically unsymmetrical sections yielding lift and torque graphs of small slope and large ordinates throughout a specified range of angles of attack; (4) specially devised sections that are aerodynamically stable; (5) open strips; (6) outside brackets; and (7) streamlining (under limiting conditions).

All formulas for aerodynamic instability contain the dimensional factor $\sqrt{B/K}$. The three measures of instability are rate of amplification, critical velocities (in the catastrophic range), and maximum amplitudes. Considerations of all three measures yield the same conclusion:

Safety against aerodynamic instability is proportional to $\sqrt{K/B}$.

This relation yields a simple criterion, of rational form on a statistical base, for quickly checking the aerodynamic stability of a proposed bridge design:

Criterion 1: The rigidity ratio K/B shall exceed 300.

The values of K/B range from 117 for the Tacoma span to 4,007 for the Williamsburg Bridge. With the exception of the George Washington Bridge, with a K/B value of 344, no bridges with a K/B greater than 300 have ever, as far as known, shown any traces of aerodynamic instability. On the other hand, all bridges with a K/B less than 300 have evidenced aerodynamic instability, in varying degree (Fig. 1).

A more accurate and more discriminating criterion, taking into account the variation in structural damping represented by the stiffening ratio R, may also be simply stated:

Criterion 2: The aerodynamic stability constant $R\sqrt{K/B}$ shall exceed 5.

The values of $R\sqrt{K/B}$ range from 0.2 for the Tacoma span to 50 for the Williamsburg Bridge. All bridges with values for $R\sqrt{K/B}$ of less than 5 have been subject to aerodynamic oscillations. All bridges with this constant greater than 5 have been aerodynamically stable.

Specification 2 is derived directly from Criterion 2, and is its equivalent if the trusses or girders provide the sole stiffening. Criterion 2 assumes, for simplicity, that the required value of $R\sqrt{K/B}$ may be taken as a constant for all sections. A still more scientific criterion, more discriminating in borderline cases and safer to use in abnormal cases, takes into account the variation of potential instability with the form and proportions of the cross section. For different section-ratios d/b, the formula values of potential torsional and vertical instability (δ) are plotted or tabulated. The formula value of the positive damping (δ_s) for any given structure is then easily compared with the corresponding recorded value of maximum δ. The ratio is the factor of safety against aerodynamic instability.

This ratio varies from 0.02 in the Tacoma span to 5.3 in the Williamsburg Bridge. All bridges for which this ratio is less than unity have been subject to aerodynamic oscillations, with a highly consistent order of vulnerability and seriousness; and all bridges for which this ratio is greater than unity have been aerodynamically stable. In the graph (Fig. 2) devised by the writer to facilitate this comparison, in order that a single curve may be used for all values of the dimensional constant $\sqrt{B/K}$, this factor is taken out of both δ and δ_s, leaving the ratio unchanged. Abscissas are the section-ratios d/b.

All bridges whose plotted points fall below the instability curve are in the unstable category, and those whose plotted points fall above the curve are in the stable classification. Degree of stability (or factor of safety) is represented by the ordinate of the plotted point divided by the corresponding ordinate of the graph. This comparison, expeditious but comprehensive, is represented by the third criterion for aerodynamic stability:

Criterion 3: The aerodynamic stability constant $R\sqrt{K/B}$ (or the value of δ, $\sqrt{K/B}$ which it represents) shall exceed the required value for the section, as tabulated or as plotted in a graph for different section ratios.

We thus have three alternative criteria, of progressively increasing scientific accuracy, to aid in quickly checking the aerodynamic stability of a proposed bridge design. We also have two alternative practical specifications (Specifications 1 and 2) to guide the designer and to serve as a quick first check of adequate stiffening. If Specification 1 or 2 is satisfied, satisfactory aerodynamic behavior may be safely assumed without further tests or special design.

Here at last is an answer to the question that has challenged bridge engineers for a century: How much stiffening does a suspension bridge require? Any suspension bridge with a stiffening system satisfying Specification 2 will be aerodynamically stable in the normally required range of wind velocities. If the EI provided by girder or truss does not satisfy Specification 2, additional stiffening must be provided by stays or other means to satisfy Criterion 2; otherwise the section must be modified to eliminate or reduce the aerodynamic instability until Criterion 3 is satisfied.

It should be noted that the alternative Specifications 1 and 2 are so worded as not to freeze progress but to encourage initiative and reward resourcefulness.

For a further understanding of the writer's ideas, as summarized and simplified in this series of articles, and for a fuller explanation or application of the graphs presented, readers are referred to his more technical article, "Rigidity and Aerodynamic Stability of Suspension Bridges," including discussions and closure, as given in the current TRANSACTIONS (1945, Vol. 110, p. 439).

Burning in the Tennessee Valley

Debris from Reservoir Clearing Was Destroyed by Many "Burning" Contractors

By Howard Ellis Davis

Division Superintendent, Reservoir Clearance Division, Tennessee Valley Authority, Chattanooga, Tenn.

A FIRE raging beyond control in mountain woodlands is a fearsome thing. Thousands of man-days of labor, badly needed elsewhere, are expended in checking the conflagration; money that could have been profitably used in some constructive enterprise has to be spent before the spreading flames can be brought under control. The experience of the TVA has shown that only strict surveillance and rigid rules for reservoir clearing crews can avoid disastrous fires. Supervision and inspection have been maintained whether the clearing operations were done by private contractors or on force account.

IN the mountain reservoirs in east Tennessee and western North Carolina, rimmed about with national forests, the TVA's Reservoir Clearance Division, in preparing the reservoirs for flooding, cleared thousands of acres of woodland. (See the writer's article, "Reservoir Clearing in the Tennessee Valley," Civil Engineering, January 1946.) In the Tennessee River reservoirs—and on some of the tributaries where conditions were less hazardous—most of the debris resulting from clearing was burned by small contractors, and contract burning became quite an industry in the Valley, but in the heart of the mountains it was a force account job. Along hundreds of miles of steep mountain sides, brush and waste timber remaining after the merchantable logs had been salvaged, were gathered into piles. Knowing full well the difficulties of controlling fires on such terrain—realizing that letting fires escape from the reservoir into timbered areas above would be bad enough, but that letting them spread into the National Forest beyond was unthinkable—the Division nevertheless had to burn this debris.

There is no such thing as a safe burning program in mountain country, but the Division took every means within practical limits to reduce the fire hazard. In the first place, there is a definite fire-hazard season during which fires in the mountains should never be voluntarily set. This begins in early autumn and usually ends during the first days of June. During that period, the dead grass and small vegetation burn readily. Atmospheric conditions are conducive to the spread of fires. Ground litter, especially in a high wind, burns with remarkable rapidity.

Seasonal Burning Schedule

Although clearing operations continued all winter, the Division always set its burning schedules in the mountains to begin not sooner than June 10. By then, vegetation had come into full leaf; new grass had attained considerable growth; atmospheric conditions were less favorable for the spread of fires. Every effort was made to complete the schedule by October 1. When the clearing units of 65 men each became burning units, each was divided into three crews. Each crew worked a shift of 8 hours. Thus, wherever the burning units were at work, the fires were kept under observation around the clock.

On Steep Slopes Timber and Brush Were "Jumped and Slid" Into Piles on the Stream Banks

Fires Started in the Morning

Crew No. 1 came to work at seven o'clock in the morning, when the forests beyond the top clearing contour and the cleared mountain sides were drenched with dew. This was the largest group and was supervised by the unit foreman, usually assisted by one of the labor foremen. During this shift the operations were shaped and plans made for the work of the other two shifts. During this first shift, the debris was set on fire.

As the area was cleared, brush had been tossed down the slope and brush piles made at a minimum distance of 30 ft from the top clearing contour. During burning operations, before fires were started each morning, men of the crew, using fire rakes with their sharp cutting edge, raked the ground litter from this 30-ft strip. Or this may have been done for a mile or so in advance by the crew that came to work the afternoon before.

During the burning operations, shoulder tanks filled with water and fire rakes were kept in readiness along the top contour, at the timber line, and were moved forward as the work progressed. Now, to be on guard, and to man this equipment if needed, a patrol was established, giving each man a post he could adequately cover in the area above the burning debris. Within a few hours, quite a large area of debris could be set on fire. The extent of this had to be watched closely. An adequate area had to be set, but there was always the danger of starting more than the second and third crews could maintain.

Work Let in Small Contracts

In the Tennessee River reservoirs, and on some of the tributaries where the valleys spread, most of the debris developed from clearing was burned by small contractors. But even here some of the most difficult of the work was done on force account. For instance, a heavily timbered slough, deep in the heart of a swamp, without adequate drainage, always filled with water during the first heavy

BEFORE BURNING, MARKETABLE TIMBER WAS SALVAGED

AN AREA LYING WITHIN A RESERVOIR, WHERE CLEARING AND BURNING OF DEBRIS HAVE BEEN COMPLETED

IN THE KENTUCKY RESERVOIR, DEBRIS WAS PILED FOR BURNING BY TIMBER RAKES

NO SMALL TASK WAS PRESENTED IN BURNING LOGS, HUGE BUT VALUELESS

rain. So when it was cleared, a unit was sent in as soon as possible to burn the debris. This was also done on some of the islands in the rivers and on certain stretches of stream bank where the logs and brush had to be piled near the water. As clearing schedules drew to a close, force account crews had to come in and take over the burning from those contractors who were lagging. Out of a total of 172,764 acres of debris burned, 52,316 acres were burned on force account, at an average of $14.13 an acre.

CONSTANT SUPERVISION OF WORK REQUIRED

From the standpoint of economy, the burning of debris in the reservoirs lent itself particularly well to operations by small contractors, and the Division used them whenever it was safe from the standpoint of schedules and terrain. In fact, these operators burned by far the greater part of the acreage.

Those who followed burning as a job worked in small groups of two or three, conducting their operations pretty much when and as they pleased—just so they did not let the fires escape from the reservoir into the woods, and cleaned up the area to the satisfaction of the superintendent in the time allotted by the contract. In the Kentucky Reservoir, where the timber rakes were in use, this type of small contractor was a great help in burning the big windrows into which the debris had been gathered.

Most of the contract burning was done by local farmers as a side line. The area contracted was usually some woodland near the farm. When a contract was to be allotted for burning the debris on a great swamp area that had been cleared, the area was blocked off into convenient acreages by lines of tall poles stuck into the ground. Each family was assigned the plot it was to burn. Then, from the nearby hill farms they drove down in their wagons, picnic style—wives, children, dogs, water kegs, and dinner.

In this fascinating new way of making a "money crop," as they termed it, the entire family often helped. The length of the contract was made as liberal as was practical, so that burning could be done as a side issue of the farm work, a condition of which they took full advantage. Burning might not be in progress for several days; on the other hand, if fires were going well at the end of a day, the farmer might continue working until dawn. When the area had been cleaned up to the satisfaction of the Division's inspector, the contractor was eligible for payment. Many of these farmer-contractors claimed that what they earned on burning, done at odd times, amounted to more than the cash income from their farms.

With so many small operators of all degrees of dependability, a broadminded but very rigid administration of the work was necessary. The superintendent's selection for a director of the burning operations was a man on his staff who was a good psychologist as well as a good operator. Because constant supervision and inspection of this work in the many small areas were necessary, he was assisted in the larger reservoirs by one or more burning aids.

Contract burning in the Valley was done at a cost to the Division of $5.10 an acre, bringing the average cost of all burning, both force account and contract, down to an average cost of $7.84 an acre. Some 9,500 burning contracts, each an independent transaction, were made with small operators of all types. These small business men burned 120,448 acres of debris, and the industry brought them an income of more than six hundred thousand dollars.

Engineers' Notebook

Suggestions and Practical Data Useful in the Solution of a Variety of Engineering Problems

Blast Holes Shot Into Volcanic Slag

By GEORGE A. CUNNEY

19TH NAVAL CONSTRUCTION BATTALION

ONE of the major projects carried out in its entirety by Seabees during the middle of the war with Japan was the building of a vital road on New Britain which linked the landing area at Yellow Beach with the Cape Gloucester Airport at one end and with Borgen Bay and Hill No. 660 at the other. The 19th Naval Construction Battalion did this job. They landed with the Marines and fell to their task with a vengeance the very first day ashore. In record time they had constructed approximately 20 miles of good, serviceable, all-weather road—including bridges, culverts, and seawalls—along beaches, across swamps, and through jungle where not even a path had existed before.

At Silimati Point the road to Borgen Bay passed between the beach and a high hill which the Japs had entrenched. Observation revealed that pillboxes had been dug into a volcanic lava formation, and test pits that were dynamited revealed a uniform bank of reddish gray and black volcanic slag, with a percentage of iron ore included, making it very hard and durable.

The hill, entirely of volcanic deposit, was about 400 ft in diameter at the base and 80 ft high. Six or eight feet of red clay, unsuitable for road surfacing, covered it. This clay was removed by power shovel, and it was then discovered that the underlying slag was cemented together too compactly for a shovel to handle effectively. Blasting was resorted to, and soon a stock pile of loose material, consisting of particles about the size of pea gravel, was at hand. This was easily loaded on trucks by a 3/4-cu yd shovel. A trial section of the new road was covered with a 6-in. layer of this material and then spread with patrol graders. After compaction by traffic and final shaping and grading, the lava-surfaced road was virtually a monolithic slab which stood up admirably under heavy traffic, including track vehicles.

It was first thought that the slag would be used for road surfacing only, but soon aviation engineers began hauling it away for runways at the airport and decks for hospital, tent, galley, and living quarters. Long before the face of the pit was widened out to permit two shovels to work in it, a line-up of over one hundred trucks waiting for slag was common. Soon, the question of whose job rated the highest priority became critical, and as a consequence, the ranking military officer provided the Battalion with a priority list. The demand called for speeded-up activities at the pit and was responsible for a search for faster means of getting the stuff out. From the start, the blasting crew had experienced difficulties. Holes had to be drilled 8 ft deep and then enlarged with small charges of dynamite in order to provide holes capacious enough to load with charges consisting of one bag of crater powder and a half case of dynamite. This method did not provide enough material to occupy one 3/4-yd shovel for the full 24 hours. However, a more efficient method was soon in operation.

The new method involved the use of a Sherman tank firing 75-mm shells directly into the face of the pit. H. E. shells were first tried but they exploded on the surface with very little penetration. But armor-piercing shells filled the bill. They penetrated as deep as 10 ft and produced holes 10 in. in diameter. A certain amount of necessary clearing out of these holes was accomplished by using improvised long-handled shovels. The shooting method proved to be successful, and an average of 20 holes per day brought down enough loose material to require the services of three shovels working the full 24-hour day to load it. A comparison of results obtained by both methods follows:

A dynamite crew with compressor and drills, working 12 hours, blasted down enough material to occupy one shovel 20 hours.

One Sherman tank, firing 20 shells in approximately one-half hour, plus the pit crew working a day of 9 hours for cleaning and charging the holes, provided sufficient material to keep three shovels busy 24 hours a day.

GENERAL SHERMAN TANK SHOOTING A 75-MM ARMOR-PIERCING SHELL INTO FACE OF TARGET HILL

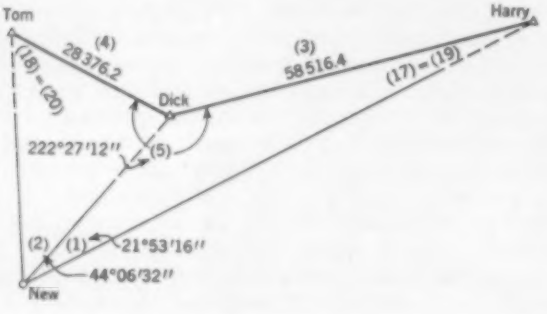
That "Three-Point" Problem Again

By R. M. WILSON, M. ASCE

CHIEF, SECTION OF COMPUTING, U.S. GEOLOGICAL SURVEY, WASHINGTON, D.C.

FOR a long time, the surveyor's location by three-point resection has been a challenge to computers and mathematicians. In CIVIL ENGINEERING for March 1945, page 148, Alger C. Gildersleeve, M. ASCE, remarks that interest in this problem has a periodicity of about thirty years. As long as the problem keeps bobbing up, it would seem that a sufficiently convenient solution has not yet been proposed. In the U.S. Geological Survey we are using a "mechanized attack" that we think is pretty neat.

Represented in Fig. 1 is any case in which the two new triangles, having given lines as bases, do not overlap.



KEY, using symbols only

AT STA:

(12) = 3 ÷ 8

New (1) Observed	(8) = sin 1	(3) Given	
Dick (21) = 180° − 1 − 19	(23) = sin 21	(27) = 12 × 23	
Harry (19) = 17	(24) = sin 19	(28) = 12 × 24	

(13) = 4 ÷ 9

New (2) Observed	(9) = sin 2	(4) Given	
Tom (20) = 18	(25) = sin 20	(29) = 13 × 25	
Dick (22) = 180° − 2 − 20	(26) = sin 22	(30) = 13 × 26	
Dick (5) Given			
(6) = 1 + 2 + 5		(14) = 12 ÷ 13	
(7) = 360° − 6	(10) = sin 7	(11) = cos 7	
Harry (17) = $\tan^{-1}$ 16	(16) = 10 ÷ 15	(15) = 11 ÷ 14	
Tom (18) = 7 − 17			

Specimen Computation

		156 968.8	
New	21° 53' 16"	.372790	58 516.4
Dick	145 17 12	.569471	89 389.2
Harry	12 49 32	.221983	34 844.4 ✓
		40 769.0	
New	44 06 32	.696024	28 376.2
Tom	58 43 28	.854680	34 844.4 ✓
Dick	77 10 00	.975020	39 750.6
Dick	222 27 12		
	288 27 00		+3.850290
	71 33 00	+.948600	+ .316477
Harry	12 49 32	+.227663	+4.166677
Tom	58 43 28		

FIG. 1. SURVEYOR'S LOCATION BY THREE-POINT RESECTION

Generally it will be desirable to use the third line between the fixed points, even if it has to be computed, to obtain a check triangle. From the three triangles so based upon the three known lines it will always be possible to select two that do not overlap.

The known lengths of the bases (3) and (4), and the angle between them, (5), are given; the angles (1) and (2) are observed at the new station, as subtended by the bases. The problem is to solve the two triangles by finding second angles, (17) and (18) respectively, for each triangle.

Theory requires that (17) and (18) shall satisfy two conditions, expressed by these simultaneous equations:

$$(17) + (18) = 360° - [(1) + (2) + (5)] = (7)$$

$$\frac{\sin (18)}{\sin (17)} = \frac{(3)}{\sin (1)} \div \frac{(4)}{\sin (2)} = (14)$$

The right-hand members of these equations contain only known quantities, so they may be reduced at once to (7) and (14), respectively; then transforming and combining:

$$(18) = (7) - (17)$$

$$(14) \sin (17) = \sin (18) = \sin [(7) - (17)]$$

$$= \sin (7) \cos (17) - \cos (7) \sin (17)$$

Divide by cos (17), and rearrange:

$$\tan (17) = \frac{\sin (7)}{(14) + \cos (7)}$$

It is best to assign the symbol (17) to a "wing" angle that is not near 90°, because it is to be found through its tangent. Then (1) and (3) belong also to the triangle containing (17), and this triangle should occupy the upper part of the form.

Computation may be most easily explained by a "key," containing only reference numbers, arranged step by step to correspond with an actual numerical solution. This is in three parts which are: the upper space for solving the triangle containing the selected angle (17), which we plan to find first; a similar space for the other triangle; and the third space, required for the three-point solution. Progress through the computation should be in the sequence indicated by those reference numbers that are encircled. The computer will not need the "key" after he has performed one or two actual computations.

The angle used for (5) must be the one through and including the triangles, even if it is more than 180°. If the new station is close to the circle passing through the three base points, the solution becomes weak, and is indefinite when (6) = 180°. In the third part of the computation, particular care must be exercised to use the correct sign for cos (7) so that (15) will be the true algebraic sum, and so that (17) may be taken in the proper quadrant, according to the sign of its tangent.

Finally, the sides (27) (28) (29) (30) are found on the same lines with the angles that are opposite to them in their respective triangles, and of course (28) and (29) should check.

A Method of Plotting Fixes on a Hydrographic Survey

By GEORGE F. NECHWORT, JUN. ASCE
CIVIL ENGINEER, DREDGING DIVISION, THE PANAMA CANAL, GAMBOA, C.Z.

AN interesting method of plotting the fixes on a large hydrographic survey was recently employed by a survey party of the Dredging Division of the Panama Canal. A survey of a large dumping area, near the Pacific entrance to the Canal, was required. In the past such areas had been surveyed by running the sounding boat on tediously set buoy ranges, and the fixes were located by the intersection of sights from three transits on shore points. Such a survey was always a slow and trying job and gave results not always entirely satisfactory, since the tidal currents made it difficult to keep on the ranges, and often large gaps were found after the survey was plotted in the office.

Consequently, for this particular survey, it was decided that two sextants would be used to locate the fixes, and the location of the sounding launch would be plotted

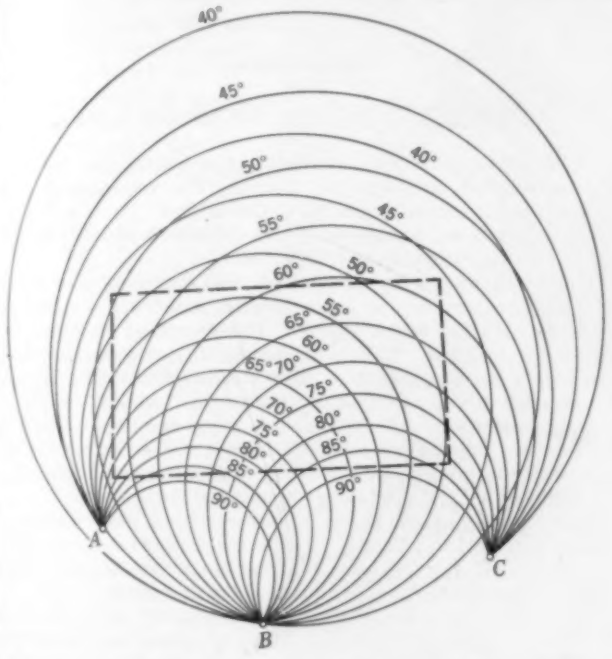


FIG. 1. PLOTTING SHEET CONSISTS OF A SERIES OF CIRCULAR ARCS THROUGH CONTROL POINTS, EACH ARC CORRESPONDING TO A MEASURED ANGLE AT SOUNDING LAUNCH

immediately after the shots were taken. For the scale selected (1:5,000) a three-arm protractor would not be large enough to reach the control points, which were at least several miles away from most parts of the area covered. Therefore the method to be described was used.

This method is based on the geometrical fact that the locus of all points, from which two fixed points will subtend a certain angle, is a circle which passes through the two fixed points. Inspection of Fig. 1 will readily show that if two angles are measured, using two adjacent pairs of control points with one point common, the position of the boat at that instant will be at the intersection of the circles through the control points.

A plotting sheet was prepared by drawing a series of circular arcs, through the control points, corresponding to various angles subtended by each pair of control points. Near the control points an arc was drawn for each degree of angle while at the outer extremities of the area an arc was drawn for each 15 minutes of angle, since the spaces between the arcs were larger for the smaller angles. The geometry involved in preparing the plotting sheet was quite simple, as will be apparent by reference to Fig. 2.

Points A and B are control points on the shore, and the boat is at C, any point on the circle. It is necessary to find the length of OD to locate the center of the circle corresponding to the measured angle α. From plane geometry,

$$\text{Angle } \alpha = {}^1/_2 \text{ angle } AOB = \text{angle } \theta$$

$$AD = {}^1/_2 AB$$

$$\text{Cotangent } \theta = OD/AD = \text{cotangent } \alpha$$

Therefore,

$$OD = AD \text{ cotangent } \alpha$$

So, to locate the center of the circle, which passes through the three points, it is only necessary to multiply one-half the distance between the control points by the cotangent of the observed angle and lay off the resulting distance (to the proper scale) on the perpendicular bisector of the line between the control points.

This procedure was used for each pair of control points, and the final plotting sheet was similar to the area enclosed by the dashed lines in Fig. 1. On the actual sheet the arcs were more closely spaced, since a smaller angular increment was used in its preparation. It was a simple matter to interpolate between the arcs for each observed angle and locate their intersection for each fix. In a short time the plotter became very adept in plotting the fixes and had no difficulty in keeping up with the movement of the launch. He was thus able to advise the launch operator of any changes in course necessary to cover the area perfectly. The position of the launch was known at all times and no unnecessary work was done, since the limits of the survey had been plotted, in

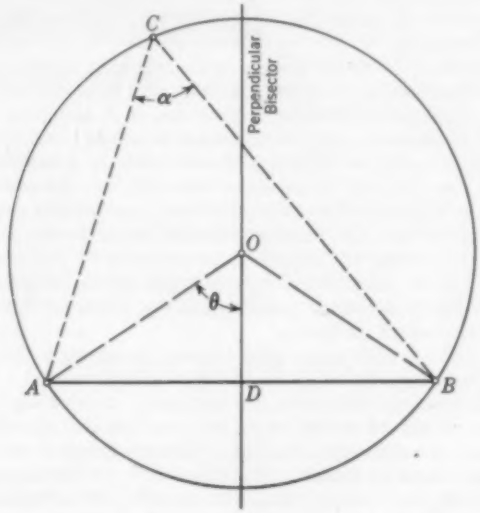


FIG. 2. LOCATION PLOTTED ON CIRCLE THROUGH CONTROL POINTS

advance, on the sheet. In practice the fixes were actually plotted on a sheet of tracing paper placed over the plotting sheet and properly oriented. In this way the plotting sheet is kept available for future surveys in the area which it covers.

The method described proved highly successful on this particular survey, and perfect coverage of the area was effected in a minimum of time, in spite of the fact that fairly swift tidal currents prevail in the vicinity.

It is not the writer's intention to present this as a new idea or as his own idea, since neither is the case. This paper is presented with the hope that it may prove helpful to other persons performing surveys similar to that described.

Our Readers Say—

In Comment on Papers, Society Affairs, and Related Professional Interests

Summary of Guide to Industrialization of China Available

TO THE EDITOR: Readers of CIVIL ENGINEERING may be interested to know that a summary of the *Guide to the Industrialization of China*, reviewed on page 482 of the October issue, was published in the May 1945 number of the *Chinese Institute of Engineers Journal* (Vol. 3, No. 1).

Copies of the summary are available to Society members upon application to the Publication Committee of the American Section of the Chinese Institute of Engineers, Suite 1918, 630 Fifth Avenue, New York 20, N.Y., at a cost of 50 cents.

CHEN-HSU T'ANG, Assoc. M. ASCE
Vice-President, American Section, Chinese Institute of Engineers

New York, N.Y.

A Standard Filing System for Engineering Drawings

TO THE EDITOR: In a discussion in the September 1945 issue, C. Terry du Rell took exception to the attempted modification of the Dewey Decimal System as a classification for a standard filing system for engineering drawings, explained in my article, "Needed—A Standard Filing System for Engineering Drawings," in the July 1945 issue. My proposed modification of the Dewey Decimal System was given as a suggestion and required an unlimited amount of consideration and constructive criticism. In view of the wide scope of the proposed standard filing system, it is my opinion that an individual would be unable to originate a comprehensive classification of drawings and that, therefore, any attempt at classification should be accomplished by committees representing all fields of engineering.

The Dewey Decimal System was originally developed as a general classification of library material, and there can be no doubt as to its extraordinary value. However, it is apparent that any attempt to use a general classification of subject matter as a detailed classification of drawings would result in considerable confusion. Even though a system of classification developed a century ago is elastic to the extent that the classification could be expanded to include the number 629.136 for airdromes, there still remains the problem of providing file numbers for the many drawings needed to describe the construction details of an airdrome. As many as 50 drawings are sometimes required in detailing the construction of an airdrome.

From 1940 to 1945 many projects were designed, which required a set of contract drawings numbering as high as 100. The field engineer, consequently, was lost in a maze of drawings in his attempt to obtain the details of the construction and was required to spend considerable time fumbling through them in an effort to obtain the required detail. Therefore, any attempt at a standard filing system for drawings should be detailed to the extent that an individual detail or drawing is immediately available, and does not require excessive thumbing through the drawings.

As previously stated, the proposed modification of the Dewey Decimal System for engineering drawings was submitted as a suggestion, and the primary object of the article was to indicate the need of a standard filing system as a means of combating inefficiency. It seems to me that if an attempt were made to provide a standard filing system for drawings, the ensuing discussion and constructive criticism would result in a more efficient filing system.

Mission, Kans. RALPH W. SPEARS, Jun. ASCE

Metric System Widely Used

TO THE EDITOR: I was pleased to see, in the October 1945 issue, the three letters on the metric system. This correspondence evidences the interest of engineers in the subject. As is well said in one of the letters, discussion of this important matter should be calm, avoiding prejudice and bitterness.

Our company has for many years used metric units in drawing plans for construction in Latin America and other countries that have adopted the metric system. Engineers and draftsmen, who had heretofore used English measures only, soon learned to use the metric system efficiently. We are therefore interested in the progressive use of metric measures in this country; inefficiency results from the continual necessity of converting from one system to the other. Personally, I believe it will be desirable to work out over a term of years, a method of adopting the metric system in this country and gradually superseding the English.

I was glad to note in L. M. Winsor's article, "Flood Control and Diversion Works in Persia," also in the October number, that he made use of metric measures, trusting to the intelligence of readers of CIVIL ENGINEERING to understand the units used.

Whether or not our country will eventually adopt the metric system of weights and measures, it would appear intelligent for our engineers and writers to recognize that practically the entire world, except the United States and Great Britain, utilizes the metric system. CIVIL ENGINEERING doubtless has readers throughout the non-English-speaking world, and it would seem wise to cater to them in some degree, rather than to use English units exclusively in articles.

Among the letters in the October number is one from Paul Van Buskirk, suggesting the use of "uncial parts" in expressing measurements of length. I have also read recently of a number of systems incorporating decimal subdivisions of a basic unit; one of these, the so-called "Macroblox Decimal System," adopts a basic unit equivalent to 40 in.

It appears that advocates of adherence to English measures go through strange contortions in the attempt to make these measures convenient for everyday use, and to avoid the awkward ratios of conversion between different units and the use of vulgar fractions. The way to obtain full advantage of decimal measures is by gradual adoption of the metric system, with its relatively simple units and relations between units, and with its uniformity with the practice of over fifty countries throughout the world.

LOUIS ELLIOTT
Consulting Mechanical Engineer, Ebasco Services, Inc.

New York, N.Y.

SOCIETY AFFAIRS

Official and Semi-Official

Wesley Winans Horner, Society President for 1946

SOME MEMBERS will make their first acquaintance with Wesley Winans Horner, new President of the Society, through this brief story. As they gaze at his portrait they will discern intelligence and friendliness. These traits will only be accentuated on more intimate association. But in addition they will then find many other admirable characteristics. The following review will serve merely as an introduction and, it is hoped, an encouragement to closer contacts.

Most members must already know considerable of Mr. Horner's accomplishments. Certainly they have not been hidden. On the contrary, his manifold services to the Society and the engineering profession have been repeatedly mentioned in these pages, in connection with his present and previous offices.

WESLEY WINANS HORNER, 1946 PRESIDENT ASCE

ST. LOUIS HAS BENEFITED

They will know, for instance, that his youth, his education, his public service, and his professional accomplishments have all centered in or near St. Louis. They will recall his almost thirty years with that city's government and his responsibility for a variety of great projects, such as the River Des Peres Drainage Project, the Municipal (Lambert–St. Louis) Airport, and the Oakland Express Highway; his period as professor and lecturer at his alma mater, Washington University; his consulting services to the government in the Public Works, Soil Conservation, National Resources, and other departments. And they will remember his contribution to Society activities such as publications, committee work, and Board service. Finally, they will recognize that his firm has had a notable share of consultation work in many parts of the country, with emphasis on airports, sanitary and hydraulic engineering, and in fact almost every phase of municipal engineering.

These accomplishments need no detailed repetition here. Rather an attempt will be made to picture the man himself, to note the characteristics of thought and behavior that have brought him the highest recognition and honor his fellow engineers can bestow.

BY NAME AND BY NATURE

His given names always constituted a problem for his friends. Long ago, many of his intimates decided that these distinguished appelations were too much to handle in formal use. Fortunately, they could turn to an old nursery rhyme for a substitute. Thus it was he acquired the nickname of Jack; and Jack Horner he remains to most of his older friends. It is typical of him that he found this more amusing than did some of those who used the nickname.

By Mrs. Horner and just a few closer friends, he is addressed as Winans; seldom is he called Wesley. Recently, when one of his grandsons was named after him, he commiserated with the child and laughingly admonished him to grow up stern and rugged if he wished to be worthy of his Southern Methodist ancestors who bore the names of Wesley and Winans. "That's something I've never tried to do," he avers.

But that statement would seem to be an overly modest one, for his is a strong character. By nature quiet and unassuming, he believes in the correctness of facts, truth and honesty as representing the most effective approach in salesmanship. Supporting that belief, he can be, and is, skillful, stern, and persistent in presenting and following up what he believes to be a proper course of action. It is these qualities, rather than what is tritely known as "personal magnetism," which underlie the forcefulness of his character.

POLITICS ARE TABOO

It is of more than passing significance that veteran St. Louis newspaper reporters spoke of him as being the "most honest" man at the City Hall during his long career in public service. He greatly appreciates this estimate, but without in any way looking down upon or condemning others in the city administration.

He has never entered actively into politics, and his one experience with its sudden turn of fortune convinced him more than ever that his talents lie in other fields. During a long period of Republican control of St. Louis he rose steadily in technical responsibility and public esteem, only to find his work terminated suddenly in 1932. At that time his great responsibility for putting the noisome River Des Peres sewer underground was not completed, and the incoming Democratic administration found it necessary to solicit his aid on a consulting basis in finishing the job. This, he felt, bore out his ideal of sticking to the task at hand, and doing the job regardless of circumstances.

A HOME AND FAMILY MAN

Those who have met Mr. Horner at Society meetings will know that it is hard to think of him apart from Mrs. Horner. He is a family man first, last, and all the time. His whole life has been built around his family and his home, both of which he enjoys and cherishes to the full. Whatever the problems he faces, he has always found rest and relaxation at home—and he likes quietude. While enjoying good company, he doesn't seek it out, and is a great hand at amusing himself. Solitaire is a favorite game, and he often plays it while lending an attentive ear to family chatter

and activity going on around him. Another favorite relaxation is a game of bezique with Mrs. Horner who, he admits, is usually too good for him. Neither of them plays bridge. He has for years enjoyed irregular sessions with three "old cronies," at the intricate card game called skat, at which he is frequently the winner.

Basically, however, he is primarily interested in serious thinking. His turn of mind is scholarly, and his powers of concentration are one of his most valuable attributes. He has always been a student, and still likes nothing more than to sit down and ponder involved mathematical problems; as for instance, his original work on rainfall and runoff—an accomplishment which won for him and F. L. Flynt the Society's Rudolph Hering Medal in 1937. At home, too, he can often be found sitting in a comfortable chair at a card table covered with graphs and pages of calculations. Because of his gift for mathematics, his sons have often remarked that he "carried" them through their high school and college math, chemistry, and physics.

FROM A GOOD INHERITANCE

They have also remarked at his wide interest in, and knowledge of, natural scientific subjects. He gave his boys a fine understanding of the fundamentals of such things, which immeasurably broadened their education, and which in turn is evidence of his own natural curiosity and broad understanding of many fields not particularly close to his daily work.

The Horner family includes four splendid sons. As might be expected, they are studious, a natural inheritance not only on the paternal side, but also from their mother, daughter of a former chancellor of Washington University. Mr. Horner once remarked that his sons' pursuits and talents include all the things he would like to study if he had time.

Frederic, the eldest, who was released recently from Naval duty, is a musician and "by trade" a teacher of the classics, which Mr. Horner admires. The second son, John, is a physician. The third, Richard, a Rhodes Scholar at Oxford, is now in the telephone business, specializing in public relations. The fourth, David, will be a farmer when he returns from the Army and completes his studies in agriculture and agricultural engineering. Mr. Horner is perhaps more closely interested in the latter field, because of his great interest in soil treatment, water use, and conservation of natural resources. This interest ties in naturally with his work with moving water, flood control, regional stream valley studies, etc. The fact is that the widely varying pursuits of his family are merely evidence of different aspects of his own broad knowledge and interest in different fields of activity.

As a teacher and as a practicing engineer he has always abhorred sloppy thinking. Rather, he displays a remarkable ability to get at the heart of a problem or a subject, and work on the essentials. One of his sons, David, the only one to study engineering, and then only as part of a course leading to a degree in agricultural engineering, remarked that he had never had a teacher so "tough," so exacting, and so impossible to "bluff" when he didn't know the right answer, as his own father, then serving briefly as professor in the Engineering School of Washington University.

LIGHTER AVOCATIONS

While being essentially a student himself, and hence devoted to the ideals of scholarship and intellectual honesty, Mr. Horner has a keen appreciation of the fact that many people depend on other means of livelihood, and he has a broad understanding of people in general. He has always deplored the fact that engineers are not better speakers, and has always insisted that the ability of clear self-expression is part of a successful engineering career.

He believes, too, in the combination of the practical with the theoretical. He loves to do things with his hands—carpentry and work with tools being his forte. He is not interested in the "fine art" end of this type of thing—just in making repairs, making things work, "puttering around." His sons recall with wry amusement how he used to keep them occupied in this direction. His favorite phrases when something needed to be done around the house or yard were, "I've got a little job for you, . . ." or "Don't you want to do . . .?"

One of his great delights is music. He and Mrs. Horner are regular patrons of the St. Louis Symphony Society, missing few of the Saturday night concerts. Sunday afternoon finds them listening to the radio broadcasts of the New York Philharmonic. He has never studied music himself, and plays no instrument. Mrs. Horner plays the piano, and their eldest son, Frederic, is a talented pianist and amateur composer.

There is also a lighter side to Mr. Horner's character. He is a devotee of comic opera and a follower of the better comedians on the air. The antics of such as Gary Moore and Jimmy Durante delight him. He is a skilled punster, and rebels at the statement that a pun is the "lowest form of wit." Not much of a story-teller himself, he complains that the reason is he can't remember them. Stories with a clever turn of language are his particular delight.

RETREAT IN THE OZARKS

Although neither a hunter nor a fisherman, Mr. Horner is extremely fond of outdoor life. In his college and early married days he was a devotee of the Ozark streams, and made many a canoe trip down the Meramec River in particular. This love of the Ozark country led him to purchase, some years later, a tract of land in Crawford County, Missouri, in company with three old engineering friends. "Water Oaks" lies along the upper reaches of the Meramec, and has been one of his great sources of relaxation and enjoyment during the past twenty years. It is isolated, quiet, and unspoiled in its natural beauty, though it lies only 100 miles from St. Louis.

Easily accessible on week-ends, it is used constantly. While his boys were growing up, it was a second home, and remains dear to his heart, and to his sons and their families to this day. Mr. Horner seems happiest there. The river running below their simple, unpretentious cabins is a constant source of study and delight to him. His interest in and knowledge of running water are evident at Water Oaks. Summer afternoons, he is just as apt to be building little dams or diversion channels along the stream, as he is to be loafing in the sun or swimming. While constructing these "projects," as he calls them, he is always pointing out the effects and characteristics of running water, and relating them to some major work on which he is or has been engaged.

As indicating how simple this country life is, there is no electricity and the only running water comes from a tank into which spring water is pumped. Family life is at its height at Water Oaks. There are apt to be a number of grandchildren on hand on summer week-ends or vacations, and he is always encouraging them in some small bit of handiwork, straightening out a childish misunderstanding, or indulging in some fanciful piece of whimsy with them.

A GOOD YEAR IN PROSPECT

It will be seen that Mr. Horner personifies the "scholar and gentleman" type of engineer. His many facets of character and engineering experience make him a delightful companion, an easy person to entertain. With the regular Society meetings again resumed, it is to be hoped that during his term of office both he and Mrs. Horner will have occasion to visit many sections of the country, to resume old friendships and to make new ones. It should be a mutually profitable and happy experience for all concerned.

Meeting of the Outgoing Board of Direction—Secretary's Abstract

THE BOARD of Direction met at Society Headquarters on Monday and Tuesday, January 14 and 15, 1946, with the following members present: President J. C. Stevens in the chair; William N. Carey, Secretary and Executive Officer; Past-Presidents Pirnie and Whitman; Vice-Presidents R. E. Dougherty, Howard, and Thomas; Directors Bakenhus, Breed, Bryan, Critchlow, N. W. Dougherty, Edwards, Gamble, Gardiner, Hathaway, Koch, Saville, Scobey, Shannon, Thomson, Tipton, Tolles, and Wilson; and Treasurer Trout. By invitation members of the Incoming Board were present as observers, including W. W. Horner, President-elect; Arthur W. Harrington and J. T. L. McNew, Vice-Presidents; and Directors Shortridge Hardesty, Irving V. A. Huie, Albert Haertlein, William Roy Glidden, William M. Piatt, and Frederick W. Panhorst.

Minutes Approved

Minutes of the October 13 and 14 Executive Committee meeting in Chicago, Ill., were approved. Minutes of the Board meeting in Chicago, October 15–16, were modified in details and approved as corrected. Records of the Executive Committee meeting of January 12 were reported, its actions were approved, and its recommendations were considered—all reported herein as actions of the Board.

Annual Report Authorized

Printed copies of the Annual Report of the Board of Direction were distributed and the report was approved for presentation at the Society Annual Meeting, January 16, 1946. Excerpts from this Annual Report of the Board are given elsewhere in this issue.

Elections to Membership

Report was received from the Committee on Membership Qualifications, with Board approval, and with individual action on a number of cases.

Membership Certificates

It was voted that membership certificates be issued to Juniors on the same basis as to Corporate Members and that the overall size of all certificates be reduced. Reference is made to a separate account on another page.

Resumption of Membership

Procedures were adopted to simplify the formalities of reinstatement of membership, with standardized treatment as to financial payment. Arrangements were also concluded, looking toward the elimination as far as possible of the inactive list, particularly as to those in the military service.

Engineering Education

Report of the Society's Committee on Engineering Education was presented and approved. Brief comment appears in a separate item elsewhere; the entire report, with that for 1944, is expected to be issued in the *Proceedings*.

Employment Conditions

Report was received from the Committee on Employment Conditions, with extensive discussion. Arrangements were made for the continuance of this Society work with vigorous prosecution of various phases. Warm appreciation was extended to A M Rawn, retiring chairman.

Society Representatives

Reports were received from the Washington representative, from the West Coast representative, and from the staff representative on Salary Studies and Surveys. All were discussed and accepted.

Other Committee Reports

Brief reports were received from the Committees on Local Sections, Student Chapters, Juniors, Publications, Society Relations, Securities, and Registration of Engineers. Oral reports from various other committees were also presented. All were discussed and accepted.

Colorado Section

Revision of the constitution of the Colorado Section was requested by the Section. The recommended changes were approved.

Districts and Zones—Montana Section

Following recommendation of the Committee on Districts and Zones, final action was taken to establish the revised zoning to accommodate the Montana Section, as follows:

"That portion of Montana which formerly was part of District 7 shall be transferred to District 12 and thereby become part of Zone IV."

Registration and Model Law

Details of proposed changes in the Model Law as recommended by the conference covering this question on August 28, 1945, were considered. Approval of the suggestions was given, confirming the proposed revisions.

Budget

Adjustments in the current budget were discussed, and revisions were approved.

Other Matters

Various announcements and appointments were received and approved. A number of other matters were presented with appropriate action in all cases.

Board Members Retiring

All those members of the Board who were retiring gave brief remarks of appreciation and received engrossed scrolls commemorating their service.

Adjournment

The Board adjourned at about 5 p.m., January 15, 1946.

Meeting of Incoming Board of Direction—Secretary's Abstract

THE INCOMING Board of Direction met at Society Headquarters at 10:00 a.m. on January 17, 1946, with President W. W. Horner in the chair; and present William N. Carey, Secretary and Executive Officer; Past-Presidents Pirnie and Stevens; Vice-Presidents Howard, Harrington, and McNew; Directors Bryan, Critchlow, Gamble, Gardiner, Glidden, Haertlein, Hardesty, Hathaway, Huie, Koch, Panhorst, Piatt, Saville, Thomson, Tipton, and Tolles; and Treasurer Trout.

Engineering Societies Building

The matter of the present headquarters building, its utility, adaptation, or replacement, was reported under study by United Engineering Trustees. The question of how this would affect the Society and that of the Society's attitude on the various possibilities were discussed and referred to a committee for further study.

Study of Engineers' Economic Status by Engineers Joint Council

The work of the Joint Committee on the Economic Status of the Engineer, under the auspices of Engineers Joint Council, was discussed and commended. Steps were taken to insure that information on the progress of this work is to be disseminated to the Board members and thus to the membership.

Committee on Membership Grades

After discussion, it was decided to modify the machinery for study of membership grades. The action was to reconstitute the committee by enlargement and to make it a separate committee.

Expanding Membership

Report was made of an Exploratory Conference on Society Membership held at Headquarters on January 10 and 11, as mentioned in more detail in a separate item. The objectives of increasing Society membership and services were approved. The question of policy as to the best means of effecting the improvements was left for later Board action. Numerous problems as raised by the conference were referred to specific Society committees or to the Secretary and Executive Officer for study and recommendation. The Board expects that a full report will be made to the membership after it has crystallized its own views.

Sanitary Engineering Division Resolutions

Two resolutions were presented from the Sanitary Engineering Division relative to proposed Board action on stream pollution and on engineering personnel of the Sanitary Corps. Action was taken to advance both of these matters.

Funds for Engineering Research

Congressional action was reviewed, looking toward the promotion of engineering and other research. Action of the Board was favorable to these efforts with approval of the broadening of the proposed machinery.

Air Transport Division

Formation of the Air Transport Division was confirmed and provision was made for the selection of the Division's first officers. A separate item on this matter appears elsewhere in these columns.

Society Committees

On recommendation of the President, the Board approved the personnel of various committees as follows:

COMMITTEE ON DISTRICTS AND ZONES: J. T. L. McNew, *Chairman;* R. W. Gamble, *Vice-Chairman;* W. D. Shannon, W. R. Glidden, and Shortridge Hardesty.

COMMITTEE ON DIVISION ACTIVITIES: Ernest E. Howard, *Chairman;* R. J. Tipton, *Vice-Chairman;* A. W. Harrington, H. F. Thomson, and Shortridge Hardesty.

COMMITTEE ON EMPLOYMENT CONDITIONS: Gail A. Hathaway, *Chairman and Board Contact Member;* F. M. Panhorst, *Vice-Chairman;* C. W. Okey, Clarence D. Bowser, Sterling S. Green, and Ernest Whitlock.

COMMITTEE ON ENGINEERING EDUCATION: J. T. L. McNew, *Chairman and Contact Member;* Clarence L. Eckel, *Vice-Chairman;* Harold E. Wessman, Charles A. Mockmore, and William J. Armento.

INCOMING BOARD OF DIRECTION, 1946, GATHERED FOR ITS FIRST MEETING, JANUARY 17

Clockwise from near corner of table: President W. W. Horner; Vice-President Arthur W. Harrington, Zone I; Director William M. Piatt, District 10; Director John H. Gardiner, District 11; Director Thorndike Saville, District 1; Vice-President Ernest E. Howard, Zone III; Director Royce J. Tipton, District 16; Director Howard T. Critchlow, District 4; Director Gail A. Hathaway, District 5; Past-President J. C. Stevens; Director Harry F. Thomson, District 14; Director Oscar H. Koch, District 15; Past-President Malcolm Pirnie; Treasurer Charles E. Trout; Director Raleigh W. Gamble, District 7; Director Charles W. Bryan, Jr., District 1; Director Frank C. Tolles, District 9; Director William R. Glidden, District 6; Director Frederick W. Panhorst, District 13; Director Irving V. A. Huie, District 1; Director Albert Haertlein, District 2; and Vice-President J. T. L. McNew, Zone IV.

EXECUTIVE COMMITTEE: W. W. Horner, *Chairman;* C. W. Bryan, *Vice-Chairman;* J. C. Stevens, Malcolm Pirnie, Ernest E. Howard, and A. W. Harrington.

COMMITTEE ON HONORARY MEMBERSHIP: W. W. Horner, *Chairman;* Malcolm Pirnie, *Vice-Chairman;* J. C. Stevens, Ernest E. Howard, A. C. Polk, A. W. Harrington, and J. T. L. McNew.

COMMITTEE ON JUNIORS: Dana E. Kepner, *Chairman;* Thomas M. Lowe, *Vice-Chairman;* Edmund Wilkes, Jr., E. E. Lustbader, and John H. Gardiner, *Contact Member.*

COMMITTEE ON LOCAL SECTIONS: Lloyd D. Knapp, *Chairman;* Robert M. Angas, *Vice-Chairman;* John B. Babcock, 3d, Fred C. Scobey, and W. M. Wilson, *Contact Member.*

COMMITTEE ON MEETINGS: Ernest E. Howard, *Chairman;* A. C. Polk, *Vice-Chairman;* A. W. Harrington, and J. T. L. McNew.

SPECIAL COMMITTEE ON MEMBERSHIP GRADES: R. W. Gamble, *Chairman;* Dean G. Edwards, *Vice-Chairman;* H. F. Thomson, Van T. Boughton, W. L. Chadwick, R. L. Forshay, and J. M. Kennedy.

COMMITTEE ON MEMBERSHIP QUALIFICATIONS: W. D. Shannon, *Chairman;* H. T. Critchlow, *Vice-Chairman;* Gail A. Hathaway, O. H. Koch, W. R. Glidden, and Irving V. A. Huie.

COMMITTEE ON PRIVATE ENGINEERING PRACTICE: John W. Cunningham, *Chairman;* Alfred J. Ryan, *Vice-Chairman;* L. H. Nishkian, R. N. Bergendoff, and W. M. Piatt, *Contact Member.*

COMMITTEE ON PROFESSIONAL CONDUCT: Frank C. Tolles, *Chairman;* R. J. Tipton, *Vice-Chairman;* R. W. Gamble, Thorndike Saville, Albert Haertlein, and F. M. Panhorst.

COMMITTEE ON PROFESSIONAL OBJECTIVES: A. C. Polk, *Chairman;* Thorndike Saville, *Vice-Chairman;* Irving V. A. Huie, R. K. Brown, Gordon M. Fair, Rossiter L. White, and Robert B. Brooks.

COMMITTEE ON PUBLICATIONS: H. F. Thomson, *Chairman;* W. M. Wilson, *Vice-Chairman;* S. C. Hollister, John H. Gardiner, and W. M. Piatt.

COMMITTEE ON REGISTRATION OF ENGINEERS: George M. Shepard, *Chairman;* Harold G. Sours, *Vice-Chairman;* H. T. Person, T. Keith Legare, and Albert Haertlein, *Contact Member.*

COMMITTEE ON RESEARCH: Boris A. Bakhmeteff, *Chairman;* Thorndike Saville, Prof. W. M. Wilson, G. R. Rich, A. E. Cummings, Frank Marston, and Roy Crum.

COMMITTEE ON RETIREMENT SYSTEM: Irving V. A. Huie, *Chairman;* William J. Shea, and Carl Beam.

COMMITTEE ON SALARIES: E. B. Black, *Chairman;* Sterling S. Green, *Vice-Chairman;* Charles S. Shaughnessy, Paul Weir, and Gail A. Hathaway, *Contact Member.*

COMMITTEE ON SECURITIES: George W. Burpee, *Chairman;* Ralph R. Rumery, and Ernest Van Norden.

COMMITTEE ON SOCIETY RELATIONS: Irving V. A. Huie, *Chairman;* F. C. Tolles, *Vice-Chairman;* and C. W. Bryan.

COMMITTEE ON STUDENT CHAPTERS: R. A. Marr, Jr., *Chairman;* G. Brooks Earnest, *Vice-Chairman;* E. A. Gramstorff, Craig P. Hazelet, F. B. Laverty, and O. H. Koch.

COMMITTEE ON TECHNICAL PROCEDURE: Ernest E. Howard, *Chairman;* R. J. Tipton, *Vice-Chairman;* A. W. Harrington, H. F. Thomson, and Shortridge Hardesty.

(Plus the chairmen of all Technical Divisions.)

Adjournment

The Board adjourned at 1:45 p.m. to meet next in connection with the Spring Meeting of the Society in Philadelphia in April 1946.

Air Transport Division Organized

A NEW Technical Division, dealing with the rapidly expanding field of air transport, has been established. The necessary formal action for this step was taken at the January meeting of the Board of Direction. It is expected that opportunity will thus be presented for consideration of all problems relating to the planning, design, construction, and operation of air terminals and airways.

The Board also provided for the appointment of the first officers of the Division. Announcement of the personnel will be made as soon as it is known.

Interest in this field has been active in the past and seems to be growing. This is indicated by the papers submitted for Society publication covering investigation, planning, design, and construction. While the highway group has previously formed the outlet for these interests, there has been agitation for a separate group, or Technical Division, devoted exclusively to this field. It was considered not only that the types of problems concerned required special attention, but also that the extent or number of those active in the field of air transport was sufficient to warrant a separate Division.

An evaluation of this interest has been under way. Cards for enrollment in the various divisions, including this new one, have been distributed by mail to the membership. The returns will be canvassed about February 1. According to present indications, several hundred members will express the wish to be affiliated with the new Air Transport Division, which seems to be getting off to a good start.

New York Meeting News

Large Society Gathering Convenes in New York January 16–19, 1946

RADAR and atom bombs are magic words with which to conjure up interest at any public meeting these days. They were used with striking results at technical sessions of the Annual Meeting in New York. These sessions were held from January 16 through 18 at the Hotel Commodore in midtown Manhattan.

USE OF RADAR FOR MAPPING

Use of radar equipment in mapping was the subject of a most stimulating discussion by the Surveying and Mapping Division on Wednesday, January 16. Here, for the first time in public session, were brought together leaders in the development of radar and authorities in its use for mapping purposes. As was stated by Chairman Philip Kissam of the conference, "No formal papers were planned. Rather it is aimed to discover possibilities that exist in the field by bringing together men who know mapping and men who know radar." If impressions formed by one of the more than 150 in attendance at the three-hour session can be accepted, striking innovations in mapping procedure can be expected as the use of radar develops.

A SEA-LEVEL CANAL

During discussion of the possibility of a sea-level canal across the Isthmus of Panama, the effect of atom bombs on the proposed and present canal was explored at the session before the Construction and Waterways Divisions. The formal paper by John G. Claybourn was discussed at great length by authorities on both canal operation and the effects of atom bombing. From the remarks it would appear that economic justification other than defense from atom bombing must be considered in future plans for the canal.

On Thursday morning the Construction Division presented another session, an impressive series of talks on federal public works programs. Relationship between the welfare of the American people and the development of public works was clearly

PRESIDENT HORNER TAKES OVER

In First Official Act, He Presents Gavel as Souvenir to Retiring President Stevens

demonstrated by representatives of the Bureau of Reclamation, the Federal Works Agency, the Army Corps of Engineers, and the Navy Bureau of Yards and Docks.

Speaking on "The Future of Resource Engineering," Kenneth W. Markwell, Assistant Commissioner of the Bureau of Reclamation, cited the dependence of 17 states on irrigation and soil rebuilding. Multiple-purpose projects in these regions have created vast new resources, providing "an increasing standard of living as a result of the benefits of an improving technology becoming available to more people," according to Mr. Markwell.

Postwar federal building programs were outlined by Commissioner of Public Buildings, W. E. Reynolds. Striking improvements in building design and equipment were described, which

PRIZE WINNERS AT ANNUAL MEETING

George H. Hickox Is Just Receiving Croes Medal from President Stevens. Other Prize Winners, from Left: Ole Singstad, Laurie Prize; Donald N. Becker, Rowland Prize; and Carl E. Kindsvater (partly hidden), Collingwood Prize for Juniors

would result in increased efficiency of federal employees. According to the speaker, these advances will soon be available to other builders in the form of manuals prepared by the Public Buildings Administration.

TRIBUTE PAID TO SEABEES

"The Bureau of Yards and Docks," said Rear Admiral John J. Manning, "must provide adequate facilities for the inactive fleet to insure beyond question that inactive vessels will be susceptible to quick recommissioning when necessary." Tribute was paid the Seabees by the Admiral, who said that a nucleus of this organization must be maintained in the postwar complement of the Navy.

Speaking for the Corps of Engineers, Brig. Gen. James H. Stratton outlined the civil works field of the Corps and emphasized the smoothly operating relationship that exists between the Corps and consulting engineers employed by it to carry out specialized assignments.

SANITARY ENGINEERING SESSIONS

Three sessions of the Sanitary Engineering Division met to deal with committee reports, papers on specific works planned, and dissertations on economic and professional relationships in the field. Economic checks on building costs were cited by L. R. Howson, Chicago consulting engineer. "If costs rise too high, the public will refuse to pay the prevailing prices and construction will come to a dead stop," he said.

In the present situation, rising costs will materially retard construction and engineers must anticipate that "much public work will be deferred or abandoned." In part responsible for the situation, according to Mr. Howson, are conflicting economic policies of pricing and wage stabilization.

Water-system improvements at Philadelphia and Chicago were described by Eugene A. Hardin and W. W. DeBerard, respectively, at the Thursday morning session of the Division. Later Karl R. Kennison presented a paper on proposed sewage works for Boston. Other papers on the use of DDT, on sanitary engineering work in

Germany, and on standardized plans for sewage disposal were presented during these meetings.

HYDRAULICS DIVISION

Throughout Thursday the Hydraulics Division was in session with its "Symposium on Hydrology in War and Peace." Six separate papers and numerous discussions were presented to the assemblage. Prediction of flood flows on the Rhine River by War Department engineers was described by Franklin F. Snyder. The ability to accurately foretell stages of the Rhine in those

HONORARY MEMBERSHIP PRESENTATION

Director Fred C. Scobey (center) Has Just Presented Dr. Boris A. Bakhmeteff (Left) for the Award. At Right, Frederick W. Panhorst Holds Certificate for Another New Honorary Member, Charles H. Purcell, Who Was Unavoidably Absent

critical days of the advance into Germany by Allied forces, made possible savings in both men and material in forcing the difficult crossing.

Other papers presented before the Hydraulics Division dealt with the presenting of hydrologic data to juries, a study of stream-flow records, military water supplies, design of airport drainage facilities, and a method of plotting overland flow on a dimensionless hydrograph.

SOIL MECHANICS AND FOUNDATIONS

A considerable volume of technical detail was presented for the use of engineers in the field of soil mechanics and foundations. During two sessions of this Division, a "Symposium on Earth Dams" held the attention of large groups. Lengthy discussion was held on pore-water pressure, evoked by the paper read by Ralph B. Peck on this subject. Methods of determining stability of earth dams, as studied by a subcommittee of the Division, were outlined, followed by a similar report on the consolidation of materials in these structures. Seepage and current slope practice were also covered in the symposium.

JOINT SESSION ON TRAFFIC CONGESTION

The Society's Highway and City Planning Divisions joined forces to attack the menacing problem of traffic congestion in American cities. As was pointed out by several of the speakers at the January 18 session, traffic congestion is extremely costly and, as it grows more severe, threatens the very existence of highly centralized business districts. Six experts in addressing the group attempted to "fracture into its basic elements" the problem created by rapidly increasing automobile traffic. Elements discussed were traffic engineering, mass transportation facilities, expressways and parkways, off-street parking facilities, police enforcement, and city planning and zoning.

Other Divisions holding meetings were Engineering Economics, Power, and Structural. Throughout all the meetings, many excellent papers, of value to many engineers throughout the country, were presented. As has been done in the past, many of these will be printed in publications of the Society—up to the capacity of PROCEEDINGS and CIVIL ENGINEERING.

BUSINESS SESSIONS OF SOCIETY

An outstanding feature of the Wednesday morning business session of the Society was the simple but impressive presentation of Honorary Membership to three outstanding engineers. Those so honored were Boris A. Bakhmeteff, Charles F. Kettering, and Charles H. Purcell. Dr. Bakhmeteff was the only one of the three on hand to accept the honor, as unfortunate circumstances prevented the attendance by the other two recipients.

Awarding of prizes was also a part of the business session. Special contributions of ten members of the Society were thus acknowledged. Following the presentation of these awards, outgoing President Stevens introduced his successor, W. W. Horner, who responded with a brief address.

Before a large turnout at the Wednesday luncheon, Dr. Bakhmeteff spoke on the relationship of "Science and Engineering." The engineer, he asserted, must evince a greater interest in the world in which he lives if he is to avoid the glaring disproportion between his responsibilities and his influence in shaping policies. Engineers in their research have "laid the basis for the unprecedented technical potency, of which the world has been witness and of which it nearly became a victim," he added.

SOCIAL GATHERINGS

Highlight of social activity during the New York Meeting was the dinner and dance in the Grand Ballroom of the Commodore on Wednesday evening. Charming companionship, delightful music, and an excellent dinner blended to create a most enjoyable atmosphere for those in attendance. During the course of the evening President Horner and Dr. Bakhmeteff were formally introduced to the party.

On Thursday afternoon a tea, arranged for ladies in attendance at the Annual Meeting, was held at the Hotel Biltmore. An unusual program, featuring a new commercial fabric made from dog hair, was presented. Models displaying various uses of the fabric and show dogs added life to the presentation.

Capacity of the Commodore Ballroom was taxed by the men attending the Dinner-Smoker on Thursday evening. Over a thousand members came to break bread and trade conversation with their professional fellows. Entertainment presented during the evening added to the gaity of the occasion. Throughout the week special groups met for college and fraternity reunions. Also there was an excursion by bus on Saturday which took members to the New York Navy Yard, where a tour of the Aircraft Carrier *Franklin* was conducted by officers, many of whom had been aboard during the terrific punishment sustained by the vessel in the Pacific. Later the party visited Idlewild and La Guardia airports.

SPEAKING OF ATTENDANCE

There is always some question, in preparing notes of a Society meeting, about which factor deserves the most attention. It is easy to seize upon attendance, for the large numbers of engineers gathered for the sessions is the first impression made on the observer. This is quickly displaced, however, when it is noticed that each one of the thousands is intent on participation in various meeting activities. For some this means a technical session, for others the social gatherings, for still others it is a "want to see Jack about his soils report," or similar specific contact.

During the week in New York nearly 2,000 members and guests engaged in this popular indoor sport. Some came to present papers—some to hear them. A group of students came from the Case School of Applied Science in Cleveland on assignment. There were members from China and Chicago, Newark and New Zealand. One, not troubled at all with distance, flew up from Brazil, while as yet uncounted numbers braved the congested subways to come in from Brooklyn. To be sure it is an inspiration to see such enthusiasm in the face of hotel-room shortages, transportation bottlenecks, and continuing office responsibilities, which most engineers find quite restraining. What splendid meetings may not be anticipated in future when, through its own ingenuity, our profession will have found solutions to all these difficulties and restrictions?

NOTES FROM THE CAPITAL
Occasional Information Transmitted by the Society's Washington Representative and Believed to Be of Special Interest to Civil Engineers

Coordination of Pollution Control by U.S. Public Health Service Favored in Society Statement

Upon invitation, a statement of Society approved policy regarding the control of water pollution was presented before the House Committee on Rivers and Harbors on November 13, 1945. The draft, prepared after consideration by the Sanitary Engineering Division and the Executive Committee of the Board of Direction, was read before the House Committee by E. L. Chandler, Washington Representative of the Society. Full text of the statement follows:

1. MY NAME is E. L. Chandler, and I am speaking for the American Society of Civil Engineers. The American Society of Civil Engineers is composed of more than 20,000 individual members. Included in our membership are leaders in all branches of the engineering profession. The Society has a Sanitary Engineering Division which includes those who are particularly interested in the problems of sanitation. This Division has considered pending legislation regarding correction of existing gross pollution of our streams, lakes, and tidal waters. Acting upon recommendations by our Sanitary Engineering Division, the Board of Direction of the American Society of Civil Engineers, in response to invitation, is pleased to submit its views on this proposed legislation.

2. It seems to us unnecessary to undertake any discussion of the need for active measures to free the public waters of the nation from the contaminating wastes that are being poured into them. Evil and unhealthful conditions that have developed are all too evident. Correction of these evils vitally affects the health and welfare of the people of the nation.

3. Maintenance of safe and adequate supplies of water satisfactory for domestic and industrial use is the problem of major importance in considering legislation directed toward correction of pollution of the country's streams. It is here that primary emphasis must be placed. Proper measures for protection of fish and wild life, and the interest of general conservation and recreation, are desirable but appear of secondary importance. With accomplishment of the major objective, the others will be reached automatically.

4. We have studied the several bills now under consideration by your Committee. We look with favor on H.R. 4070, but suggest important revisions. We strongly favor the general principles embodied in that bill.

5. Disapproval of the other bills is based, largely, on opposition to the principle of delegating disproportionate regulatory powers to the federal government or granting federal authority for punitive enforcement of regulations regarding matters of sanitation. Those powers should rest with the states, acting individually or through state compacts, and with local governmental units. Neither do we believe that the federal government should dictate to local governmental agencies or to private concerns as to the details of design or construction of specific structures for the purpose of correcting stream pollution. The federal government should set standards and check results obtained. The methods by which these results are obtained should be the responsibility of subdivisions of government below the federal level.

6. There is much value in legislation that will lead to integration of activities of federal, state, municipal, and industrial interests; that will make provision for investigation and research leading to control of water pollution; and that will provide for the formulation of overall programs and recommendations by a federal agency.

7. The creation of any new federal agency, or new division of any existing agency (such as provided in H.R. 519 and H.R. 587), for the purpose of developing and administering a program for relieving conditions of stream pollution, seems unnecessary and ill-advised. The record of the U.S. Public Health Service is long and creditable. A comprehensive program directed by the Sanitary Engineering Division of that Service, as provided in H.R. 4070, should lead to sound and constructive results.

8. The provision of H.R. 4070 for setting up a Water Pollution Control Advisory Board is excellent. The general character of the proposed Board, combining representation of federal and local governments with representation from the fields of sanitary engineering and of affected industry, affords a breadth of viewpoints, the consensus of which should be of inestimable value to those charged with responsibility for developing and administering the broad corrective program sought for under this Act.

9. The American Society of Civil Engineers is, at present, against those features in H.R. 4070 which provide for federal grants for construction. However, should Congress, now or later, make provision for federal grants for general public works construction, we assert that sanitary engineering works are among the most vital to the public interest.

10. We favor federal aid to states, groups of states, or to local governmental units in financing engineering investigations and reports covering areas now suffering from the effects of the pollution of their public waters, and, with the advice of the USPHS, for the development of comprehensive programs for the correction of these conditions.

11. We strongly disapprove those sections of H.R. 4070 which authorize the Federal Security Agency to administer the making of federal loans and grants-in-aid for the preparation of plans for construction of specific sanitary engineering works or to supervise the design or construction of such works. We refer to certain aspects of Sections 5, 6, 7 (*a*), and 8 (*b*), for example. There already exists a federal agency with a long and creditable record in administering loans and grants-in-aid for public works and in supervising their construction, so far as federal interests are concerned. We refer to the Federal Works Agency with its three major engineering and construction bureaus.

12. We are of the considered opinion that the USPHS of the Federal Security Agency is highly qualified to cooperate with public health officials and sanitary engineers at local levels in investigating, reporting upon and formulating overall programs for the correction of pollution of our public waters. These investigations, reports, and programs should be required to carry the approval of the Surgeon General, USPHS, before any specific projects under such programs could become eligible to receive federal aid in any form for design or for construction. It is the supervision of design and construction of federally aided projects and the federal administration of such aid which we feel should go to the Federal Works Agency. To place these functions in the Federal Security Agency would require a new and duplicate federal organization to be established for the review and approval of design, supervision of construction, and the administration of sanitary engineering projects in which the government has an interest. We are opposed to such unnecessary and uneconomical duplications in government.

Collective Bargaining for Minnesota Engineers

THE FACT that employment practices are still a matter of urgent importance to engineers is evidenced by recent experiences in Minnesota, as reported in the November number of the Bulletin of the Minnesota Federation of Engineering Societies. Professional employees in a public utility corporation were in danger of absorption into an A. F. of L. union which was to be formed by office employees. Faced with this problem, a unit organization of the professional men only was established and its status was made clear to all the parties involved, including the company as well as the state and national labor boards.

When it came to a showdown, the position of the engineers was acknowledged and they were excluded from the proposed union. The union was not later established but that fact is beside the point. The important fact is that since the engineers were familiar with their rights, they were able to act effectively and in time to preserve their professional status.

In general comment upon such situations, the Employment Practices Committee of the Federation has a few practical features to suggest:

"In the formation of the unit organization. . ., it is suggested that the first meetings be restricted to registered [employee] engineers in order that this restricted group may first decide the question of the definition and policy of the group. . . . If the majority of engineers. . .are registered or can be induced to get registered, . . .

the restriction to registered men is the best basis. One potent argument in cases of this nature is the fact that many professional engineers are in the category of employers with respect to nonprofessional employees, whereas they have no effective influence over hiring, firing, or other direct welfare aspects of professional employees. . . .

"It is important to emphasize the fact that any procedures, minutes, correspondence, and actions of the group be taken in a formal manner. . .with the knowledge that all of this information may at some later time become evidence before one of the labor boards in the conciliation of your case. If there is controversy between your group and the CIO, for example, for jurisdiction of certain employees, the burden will be upon you to convince the labor boards that your group is capable of taking positive action to protect the welfare of its members, and it will be necessary to convince the board that there is clear and sufficient reason for your group being separately constituted from the larger group set up under the union. It is essential that actions of the group in no way convey antagonism to the efforts of the union, nor indicate that the members are opposed to what the union is trying to do. It is important to accentuate the positive. Our purpose is to solidify the engineering profession and protect its interests in welfare matters; in other words, we are acting in a direction parallel with and not opposed to what the CIO is trying to do.

"Accept no assistance from management, do not meet on company time or premises, and exclude men who are clearly employers with respect to professional engineers. There is danger of being accused of company domination and being thrown out by the board on that ground."

Assistance in Collective Bargaining

THE PRESENT policy of the Society's Board of Direction with respect to collective bargaining activities is here quoted for the benefit of those members who desire the exact wording. This supplements the brief item on page 522 of the November 1945 issue.

At its October meeting, it was moved:

"That the Board adopt as its expressed policy that the Society give all practicable assistance to its members in the field of collective bargaining and that the Secretary be instructed to render this assistance as effectively as funds, staff facilities, and legal limitations will allow."

The Board voted to adopt this motion as outlining an expressed policy of the Society.

Mohawk Valley Sanitation Council Formed

REPRESENTATIVES of municipalities, industry, health and conservation agencies, federal departments and the Mohawk Valley Towns Association have formed a Mohawk Valley Sanitation Council, in an endeavor to clean up the pollution in this historic stream in central New York State. This organization was created at a Mohawk Valley Pollution Abatement Conference conducted at Union College, Schenectady, N.Y., on November 15, 1945, under the auspices of the Schenectady Engineering Council (of which the Mohawk-Hudson Section, ASCE, is a constituent member) in cooperation with the New York State Department of Health, New York State Conservation Department, Mohawk Valley Towns Association, New York State Conference of Mayors, Schenectady County Conservation Council, Schenectady Chamber of Commerce, Schenectady Junior Chamber of Commerce, and the Capital District Section of the N.Y. State Sewage Works Association. This conference called together leaders in government, sanitation, and conservation for the purpose of discussing the pollution problem and its solution.

Morris M. Cohn, M. ASCE, was elected chairman of the Sanitation Council.

A Steering Committee, which was appointed, will meet to formulate the program of the Sanitation Council and efforts will be made to focus the attention of the public, municipalities, and industry on the need for adequate treatment of wastes before their discharge into the Mohawk River and its tributaries. This is the first unified regional action on the part of any such group in New York State.

Final Ballot on 1946 Society Officers

To the Ninety-Third Annual Meeting *January 9, 1946*
American Society of Civil Engineers:

The tellers appointed to canvass the Ballot for Officers of the Society for 1946 report as follows:

For President

Wesley Winans Horner	4,725
Scattering	4
Blank	8
	4,737

For Vice-Presidents

Zone 1:

Arthur William Harrington	4,702
Scattering	8
Blank	27
	4,737

Zone IV:

John Thomas Lamar McNew	4,719
Scattering	1
Blank	17
	4,737

For Directors

District 1 (Two to be elected):

Shortridge Hardesty	4,709	
Irving Van Arnam Huie	4,686	
Scattering	8	
Blank	71	
Total votes registered	9,474	
Total ballots canvassed		4,737

District 2:

Albert Haertlein	4,715
Scattering	1
Blank	21
	4,737

District 6:

William Roy Glidden	4,714
Scattering	0
Blank	23
	4,737

District 10:

William McKinney Piatt	4,716
Scattering	1
Blank	20
	4,737

District 13:

Frederick William Panhorst	4,717
Scattering	2
Blank	18
	4,737

Ballots canvassed	4,737
Ballots withheld from canvass:	
From members in arrears of dues	21
Without signature	61
Total withheld	82
Total number of ballots received	4,819

Respectfully submitted,
DAVID G. BAILLIE, JR., *Chairman*
GEORGE L. FREEMAN, *Vice-Chairman*

J. Mechanic	Arthur D. Fields	George C. Maguire
Joseph Farhi	Frederick W. Ockert	E. L. Pavlo
Ernest H. Harder	R. Edward Kuhn	*Tellers*

Society Membership Studied

AN Exploratory Conference on Society Membership, just completed, holds great potentialities for Society benefit, in all the ramifications of the relationship of the young civil engineer to the Society and its endeavors. The conference was called by President Stevens at Society Headquarters, where it convened in a two-day session on January 10–11, 1946. It was composed of representatives of the Board of Direction, members in industry, in education, in utilities, in construction, in public service, presidents of Local Sections, Juniors, and members of the staff of the Secretary and Executive Officer. President-elect W. W. Horner acted as chairman of the conference.

In transmitting the report of the exploratory conference to the Board of Direction, at its January 15 meeting, President Stevens said:

"The Society has hardly scratched the surface of discovering and following through on services that could be rendered either in the technical field, or the professional, economic, and social welfare fields. We are now at the crossroads for our choice between being an outstanding static honor society or an outstanding and growing service society that will bring honor to us as leaders in our profession. I am convinced that there are thousands of civil engineers qualified for membership who can and should be helping the Society in carrying out this enlarged mission."

The report of the conference was divided into four main topics:

1. How can engineers of recognized qualifications be induced to seek membership in the Society?
2. How can the number of members of Student Chapters transferring to the grade of Junior be increased?
3. How can better participation by Juniors in Society operations be obtained?
4. What should the Society do to improve the economic status of engineering employees?

Discussion of the conference report by the Board of Direction led to the decision that the many suggestions contained in it needed the more extensive consideration of several standing Society committees. The Board expects to receive the committee reports and recommendations for further consideration, and probably implementation, by the Board at its meeting in April 1946.

Case Students at Annual Meeting

TO ALL appearances there was no group attending the New York Annual Meeting more actively interested in the proceedings than the fourteen Student Chapter members that came up from the Case Technical School in Cleveland. On assignment they completely covered each and every technical session of the week. And that's some job, be assured.

The sparkplug behind this trip was Prof. George E. Barnes, Faculty Adviser of the Student Chapter at Case. It seemed to be a businesslike arrangement too. To make the trip, the men had to be excused from classes for the better part of a week.

DELEGATES FROM CASE AT ANNUAL MEETING

Seated: Messrs. Matzo, Hardrath, Barnes, Lee, Bagemihl, Tousley; Standing: Messrs. Humphrey, Ornan, Dukleth, La Baugh, Merritt, Batts, Long, Ellis, Svec

Therefore, in order to justify the time off, each will submit on his return to Case a report covering the sessions he attended in New York.

Expenses? No sir, there were no grants-in-aid for this assignment. Each man footed his own bill. Fortunately, accommodations on the New York Central between Cleveland and New York are pretty good—even on the coaches. And if a service club or fraternity will put a man up for a night or two, well that is a "good deal."

Objective of the trip was pretty clear to all 15 of the Case men (including, of course, Professor Barnes). This was an opportunity to meet with the men who do the engineering that students aspire to, the men who write the books they study from, and, incidentally, also to give a little substance to the dreams of accomplishment a man in school has. The Professor is not the sort to pass up that kind of a chance for his students.

After the talks were over and the notes all taken, the travelers (all but one, Navy V-12) took a spin about Manhattan to take in some of the sights, all of engineering interest to be sure, before their return to the classroom.

Policy on Labor Legislation and Legislative Language

CURRENT TRENDS in labor legislation were fully discussed at the October meeting of the Society's Board of Direction, and future procedures of the Society were determined as a result. An abstracted report from a labor consultant was received and studied. Based on this discussion, the Board instructed the Secretary to continue his efforts toward remedial labor legislation.

Furthermore, the Board directed that the main objective in such remedial legislation should be legislation which would permit professional engineers to join together for collective bargaining purposes under provisions of law, but which will leave such action optional on their part, this procedure to be determined by majority vote of the professional employees concerned in any specific case. New legislation should clearly set forth provisions that the NLRB, or such other legally constituted administrative-judicial body, shall, in its determination of appropriate bargaining units, permit professional employees professionally employed to exercise or to waive, through their own votes, the right of self-organization and designation of bargaining representatives. Also, it was believed that the law should permit fully autonomous units composed of professional employees professionally employed.

The Board voted that these objectives shall express the policy of the Society in this matter.

Three 1946 Meetings Scheduled

FOR the rest of 1946 the Society has scheduled three combined technical and business sessions. The Spring Meeting will be held in Philadelphia, Pa., in April. Summer and July will find a session in progress in Spokane, Wash. For the Fall Meeting, Kansas City, Mo., has been chosen. Dates and programs for these meetings will be announced in future issues of CIVIL ENGINEERING.

Membership Certificates Now Available to Juniors

OF INTEREST to Juniors will be action of the Board permitting them, for the first time, to have membership certificates. In the past these certificates have been available only to the Corporate Membership and Affiliates, although many Juniors have requested them. The certificates may now be obtained at a cost of $1.50 upon written application to Society Headquarters, 33 West 39th Street, New York 18, N.Y.

Incidentally, a new trim size of $10^1/_2 \times 13$ in. has been authorized for all certificates, making them smaller than the old 17 × 20-in. size. The new size will have the advantage of being easier and less costly to frame. And it is also believed that the certificates will present a more distinctive appearance in the smaller frames.

The Society's Ninety-Third Year

Excerpts from the Annual Report of the Board of Direction for 1945

CONCLUSION OF World War II brought to members of our Society their second opportunity in a generation to end their traditional contributions to our nation's wartime efforts, to become, once again, civil engineers in the truest meaning of the term, and to turn their ingenuity to the more constructive and humane peaceful pursuit of building the better world for which we fought and sacrificed. For, much though engineers and science contributed to this most scientific of all wars and toward its sudden atomic-bombings conclusion, our opportunities for peacetime achievements are even greater. This is equally true of all Society members, those who were civilians as well as some 5,000 who were in uniform.

To the Society, the war's end means revitalization of our Technical Division activities which, naturally, declined during the past four years in proportion to the increase in our assistance in war work. It means, also, fuller opportunity to carry on our efforts to achieve and maintain the primary objective of the Society—the advancement of civil engineering and the professional improvement of our members.

FINANCES

The Society is in sound financial condition. . . . With an increasing membership and advertising income, the Society is looking forward to continued rise in income available for the advancement of Society objectives and service to the membership.

SOCIETY MEMBERSHIP

The upward trend of the past few years continued in Society membership, which stood at 21,100 at year-end, a net increase of 667 over the comparable figure of 20,433 for 1944.

Continuing its policy with respect to members in the Military Services, the Society has canceled the 1945 dues of 1,400 members who held the grade of captain in the Army or lieutenant in the Navy, or grades below. In addition, dues have been canceled for 750 members resident in countries from which the exportation of money is impracticable or impossible and those whose whereabouts are unknown. The names of these members are carried on an "Inactive List." As of the end of the year, 207 members became Life Members, and thus are exempted from further payment of dues.

ENGINEERS JOINT COUNCIL ACTIVITIES

Participation by ASCE in the activities of Engineers Joint Council went forward energetically. Congressional hearings on science-research legislation in November prompted Engineers Joint Council to foster a five-man panel of engineers to present evidence at the hearings. One man from each of the five participating societies was appointed and the ASCE representative, Dr. Boris A. Bakhmeteff, was selected as chairman of the panel. A clear statement of the position of the professional engineers of the nation was effectively presented by the panel at the hearings. The legislation has not yet been enacted.

Representatives of ASCE continued to participate on several Engineers Joint Council subcommittees. The principal subcommittee was the Committee on the Economic Status of the Engineer. Under that committee are three working committees, i.e. (1) Committee on 1946 Survey of the Engineering Profession (formerly Salary Survey Committee), (2) Committee on Employment of Graduate Engineers (formerly Committee on Employer-Employee Relations), and (3) Committee on Collective Bargaining for Engineers.

In September 1945, the National Engineers Committee of Engineers Joint Council presented a printed report entitled "Industrial Disarmament of Aggressor States (Germany)." The report was made public and was received with much favorable comment from the press, radio and officials of government. The report presented a "blueprint" for guidance of American authorities controlling certain fundamental aspects of the future economy of Germany. These authorities and other nationally known figures have indicated that they consider the report to be of great national usefulness and value.

Compilation of a similar report to cover Japan is being considered by Engineers Joint Council.

COLLECTIVE BARGAINING

The problem of collective bargaining and the professional engineer has continued to be a major matter of Board attention.

Discussions in the Employment Conditions Committee and in the Board during the year have completely clarified the Society's position. The Board does not now, nor has it ever, favored changing the aims and activities of the Society to those of an overall labor union for engineers. It has advocated and still recommends that ASCE Sections, through appropriate committees, keep abreast of labor union developments in their respective areas and, if circumstances warrant, themselves attempt proper protection of engineers against inclusion, against their will, in trade union groups. In the past, the Board has tried to erect sign posts to assist Local Sections in taking the right course through the collective bargaining maze. This educational and advisory effort is being continued vigorously.

The Society is a participant in a Joint Committee on Collective Bargaining for Engineers. This committee is comprised of representatives from ASCE, ASME, AIEE, AIME, and AICHE. It is expected that representatives of NSPE (National Society of Professional Engineers) soon will be added to this committee. The objective of this joint committee is to compile a handbook explanatory of existing labor legislation and regulations. It will be pointed at professional employees in the entire field of engineering. The handbook or manual is expected to be, in effect, a road map of the area of collective bargaining over which the engineer may now wish or later may be forced to travel. The handbook will be a joint effort and it will be submitted for joint endorsement by all the societies earlier named in this paragraph. Not only has ASCE continued its individual efforts in this field but it has joined with similar societies of professional engineers with a view toward exerting the combined efforts of them all.

SOCIETY COOPERATION WITH CED

During the year the Society has cooperated actively with CED (Committee on Economic Development) in its effort to stimulate the making of actual plans and specifications for public and private postwar construction.

During the war the Society organized and financed a committee known as the Committee on Postwar Construction. The objective of this committee was to stimulate preparation for postwar construction, both public and private, and the making of construction plans for it. The CED, a self-financed organization of business men and other leaders in civic life, was organized during the war, but with wider postwar objectives than our ASCE committee. However, the planning of postwar public and private construction was one of the principal objectives of CED.

Under these circumstances it occurred to some of the leaders in five of the national societies of engineers that close cooperation between the CED and the engineering profession with regard to the construction portion of postwar planning would be desirable. This resulted in the formation of a Joint Engineers' Action and Advisory Committee to correlate engineering and CED activities. The ASCE Committee on Postwar Construction, together with appointees from the other national engineering societies, formed such an Advisory Committee to CED. The ASCE furnished the money, the office, the secretarial service, and the man to do the work and travel necessary to carry out the work of its own Postwar Construction Committee and to activate field cooperation with CED among all the engineering groups. The other engineering societies furnished advice and the CED welcomed the engineers' efforts.

WASHINGTON, D.C., OFFICE

The District of Columbia Office of the Society has continued in operation under the immediate direction of E. L. Chandler. His time is divided principally between matters of federal legislation directly affecting engineers and with federal bureaus as their activities affect engineers, particularly civil engineers. Our Washington Office also seems to be a regular port of call for engineers of any branch who may be seeking information in Washington on matters on which they think engineering societies are or should be interested.

It is believed that Mr. Chandler's activities in connection with federal bureaus have been of great value to the Society and have resulted in many direct benefits to our members. The work of our Washington representatives since the office was established has

served to put ASCE on the Washington map so far as concerns federal officials who deal with engineers.

WEST COAST OFFICE, LOS ANGELES, CALIF.

H. L. Thackwell was in charge of our West Coast Office to September 30, 1945. Lt. Col. Walter E. Jessup was assigned to take over this office and its activities were resumed early in December. During Mr. Thackwell's incumbency he traveled extensively over the western tier of states and did much to stimulate interest in the Society, especially in the more sparsely settled areas which heretofore have had little contact with representatives of ASCE. One result of these travels was the establishment of a new Section for the State of Montana, with headquarters at Helena. Mr. Jessup will continue representation of the Society in the far western states.

ENGINEERING SALARY SURVEYS

The Society lent tangible assistance to three agencies that requested help in solving classification and salary problems of their engineering forces. Mr. Allen P. Richmond, Assistant to the Secretary, spent seven months in Los Angeles on a study for Los Angeles County, resulting in a report to be published early in 1946. The study ascertained the relative levels of engineering jobs in County service, resolved conflicting reports into a schedule of prevailing salaries in the area, and made other recommendations. A study was started for the Louisiana State Civil Service, to be concluded early in 1946. A new salary curve was recommended to the Arizona State Highway Commission, to supplement a complete survey made in 1940. Also, steps were taken to initiate a study for the Maryland State Employees Standard Salary Board, also to be completed in 1946. In all cases, pursuant to standard operating procedures adopted by the Board of Direction, the pertinent Local Section has lent active assistance.

APPOINTMENT OF SOCIETY SECRETARY

With the passing, on May 25, 1945, of George T. Seabury, Secretary of the Society for more than 20 years, the Board of Direction appointed Col. William N. Carey of St. Paul, Minn., to succeed him. Mr. Carey assumed his duties as Secretary and Executive Officer on June 1.

ADDITIONS TO STAFF

Two new assistants to the Secretary also were added to the staff, and two others returned from duty with the Armed Forces. Allen Wagner, a former newspaper man of St. Paul, Minn., was added to the staff, with principal duties of maintaining good public relations for the Society. Harrison D. Comins, Davenport, Iowa, is devoting his attention to intensifying the service of the Society to younger members and potential members. Captain Carl E. Beam, U.S.N.R., and Lt. Col. Walter E. Jessup returned from military duty after four and one-half and three and one-half years of service, respectively. Both are veteran Society staff members.

TECHNICAL DIVISIONS

During 1945 the 13th Technical Division of the Society, the Air Transport Division, was authorized and is expected to be activated in 1946. In December 1945, the membership of the Society was balloted for Technical Division affiliations.

With the end of the war and the return of many members from the services to civil life and active participation again in Division affairs, some of the Division executive committees have already begun to revitalize committees and consider future programs of work. To assist in this, the Committee on Division Activities has started a survey of the past work of the Technical Divisions. With the backlog of uncompleted work as a result of the war and the many opportunities for effective work in new fields, it is anticipated that new talent will be added to present committees and that new committees will be appointed as necessary to carry out projects alined with postwar developments and trends.

PUBLICATIONS

The publications of the Society include one volume of TRANSACTIONS (Volume 110, to be distributed in 1946); 10 numbers of PROCEEDINGS; 12 numbers of CIVIL ENGINEERING; and a YEARBOOK.

PROCEEDINGS.—The 10 numbers of PROCEEDINGS for 1944 contain 22 papers by 27 authors, three symposia, and two progress reports. In addition, discussions on these papers, symposia, and reports, as well as discussions on papers published in 1944, were included in the 1945 PROCEEDINGS. Subject and author indexes for 1945 PROCEEDINGS were published in the December number. Members and others who took part in the preparation of these papers and reports, and the discussions thereon, totaled approximately 270.

TRANSACTIONS.—Volume 110 is the regular annual issue of TRANSACTIONS (normally issued in the fall, but on this occasion delayed until early in 1946). It includes papers and discussions published in PROCEEDINGS from January 1943 through October 1944. The volume also contains the 1945 Annual Address of President J. C. Stevens, and 158 Memoirs of decreased members, none of which were published in PROCEEDINGS.

SUMMARY OF PUBLICATIONS FOR 1945

	Issues	Average Edition	Total Pages	Cuts
PROCEEDINGS (monthly numbers)	10	19,215	1,612	493
CIVIL ENGINEERING (monthly numbers)	12	21,325	1,256	764
TRANSACTIONS, Vol. 110 (spring 1946)	1	20,030	1,968	2
YEARBOOK (April 1945, PROCEEDINGS, Part 2)	1	19,700	520	2
	24	....	5,356	1,171

ENGINEERING SOCIETIES PERSONNEL SERVICE, INC.

Of approximately 3,600 engineers registered, 830 were placed in employment by Engineering Societies Personnel Service, Inc., through its offices in New York City, Chicago, Detroit, and San Francisco, operated under the joint direction of the national engineering societies. Approximately 15% of the applicants and those placed were civil engineers. Publication in CIVIL ENGINEERING of positions and men available was of considerable assistance to this service.

The reconversion and reconstruction periods, it is felt, will offer increasing opportunity for the placement of engineers on civilian work, just as the war made this service valuable in the placing of engineers on vital war jobs, both in private and government work.

ENGINEERING SOCIETIES LIBRARY

Both in terms of volumes of books and services rendered, the Engineering Societies Library continued its growth, the number of volumes increasing from 160,030 to 173,854. Many firms and individuals were served through searches, reproductions of literature, translations, etc., and by answers to inquiries by mail and wire services.

Library receipts from Founder Societies amounted to $40,335, as against expenditures of $45,955, which included $5,772 for books, periodicals, and equipment, but this deficit was more than offset by the receipts of $39,108 for services rendered, as against $31,735 expended for such services.

ASCE Opens Office in Los Angeles

IN ORDER that Society services to members in the Far West may be better and more promptly rendered, a Western Office of the Society has been opened in Los Angeles, Calif. Lt. Col. Walter E. Jessup, formerly with the New York Headquarters, ASCE, and recently released from active duty with the Corps of Engineers, has been appointed as Western Representative.

The new Los Angeles address of the American Society of Civil Engineers is 400 Edison Building.

Professional Card Directory Inaugurated in "Civil Engineering"

A PROFESSIONAL card directory will be inaugurated in the April 1946 issue of CIVIL ENGINEERING. This new feature of the publication was approved by the Board of Direction to enable the consulting engineer members of the Society to acquaint the readers

of the publication with the availability of their professional services.

The directory is designed to give the maximum of value both to consultants inserting cards and to readers. Card space in the directory will be restricted to individual consulting engineers who are members of the Society, and to the consulting engineering firms controlled or operated by members of the Society. All cards will be uniform in size and in type format.

The directory is to be professional in physical form as well as in character. It will be placed in a standard position in the advertising section of the publication.

New Life Members of the Society

EVERY YEAR, as of January 1, a number of members automatically become Life Members of the Society. They attain this status by having paid dues as Corporate Members or Affiliates for twenty-five years and having reached the age of seventy, or regardless of age, by having paid dues as Corporate Members or Affiliates for a period of thirty-five years.

When notified that they are to become Life Members and receive the Life Membership certificate, many write interesting letters to Headquarters. Those received this year uniformly express appreciation, but one adds, "It is terrible to have reached the age when you can qualify for life membership." Another refers to "your gracious letter, which deals so tactfully with my advancing years."

A number express surprise: "I find it hard to realize that so many years have gone so rapidly." "This news comes rather as a surprise because it is difficult to realize that I have been a member for thirty-five years." "Frankly, it had not occurred to me that under the rules of the Society I would be entitled to this honor."

Their tone is however most cheerful, and many express a desire to be of continued usefulness to the Society. For instance, a structural engineer writes: "I am in fine health and have no idea of retiring for some time, so if there is anything I can do for the Society out here just call on me."

Gratitude is the rule. From a Canadian consulting engineer come these words: "Canadian engineers, and particularly Members of the Society, have derived great benefit from your publications and their association with American engineers. Through the years they have been a source of inspiration and help to me."

A railroad president writes: "I have always considered it a privilege to be associated with the American Society of Civil Engineers and look forward to a continuation of that pleasant association in the years to come—it is a great honor to be a Life Member of our splendid Society."

From a U.S. Engineer Department engineer comes the statement, "It gives me great pleasure to be thus honored by the Society. You may be sure I will continue in active participation in Society affairs as long as possible. My only regret is that I have not been a more useful member."

The business manager of a great Eastern university says: "I shall hope to continue my association with the Society and be as always at its service." And a member of a large engineering firm feels that "any 'contributions' which I have made to the Society are much more than balanced by the benefits which have come to me from my membership."

The Society gets many compliments in these letters, both expressed and implied, for example: "The high standing of the Society makes its certificate doubly appreciated" (from the head of a municipal department). "I am naturally very much pleased" (from a county superintendent of highways). "It is with genuine pride and pleasure that I learned the Society wishes to confer on me a life membership" (from the mayor of a great city).

A former railroad chief engineer, now retired, writes from his farm, "I have always considered my membership in the Society as highly beneficial and helpful to me as an engineer, and it is a great pleasure to me to be able to continue this association the balance of my lifetime." The vice-president of a firm of general contractors considers life membership "a great honor." A consultant is "very happy to note" that he is now a "life member of a great organization." The superintendent of the water department of a large Western city states: "While I regret the years of age to a degree, I most certainly do not regret the twenty-five years of most pleasant and profitable (to me) membership in this great group." A professor of civil engineering adds these words: "Fortunately, the award does not imply a termination of active participation in Society affairs. I expect to have an interest in such affairs for some time to come."

MEMBERS EXEMPT FROM DUES JANUARY 1, 1946

Adey, John Seager
Allen, Jean March
Andrew, Clarence Raymond
Ashbrook, Chester Daniel
Ayers, Augustine Haines
Baldwin, Lewis Warrington
Benedict, Farrand Northrop
Bixby, Frederick Louis
Bosier, William Harris
Braunworth, Percy Lewis
Breuchaud, Jules R.
Brown, Grover Charles
Brownlee, James Lawrence
Brunnier, Henry John
Burnette, Chauncey Allison
Burpee, George William
Cahill, James Edward
Carbajal, Fernando
Carle, Nathaniel Allen
Carter, Clarence Elmore
Castleman, Francis Lee
Churchill, John Pierce
Claflin, Fred Winslow
Clark, LeRoy Walter
Clifford, Reginald George
Closson, Edgar Stone
Coe, Thomas Hamilton
Collins, Thomas Edward
Copeland, Frederic Lucius
Cortelyou, Spencer Van Zandt
Cowie, Harry James
Coy, Burgis Greenacre
Cromwell, George
Dahlin, John Edward Bartholomew
Dales, Oliver Dean
Dann, Alexander William
Davis, Charles Moss
Demorest, George Myron
Dewell, Henry Dievendorf
Doolittle, Harold James
Dunmire, Elijah Herbert
Durant, Aldrich
Durham, Edward Miall, Jr.
Dyer, John
Elam, William Earle
Ellsworth, Lincoln
Emerson, Charles Alvin
Ewald, Robert Franklin
Farwell, Carroll Andrew
Feller, Frank Henry
Ferguson, Lewis Repp
Fifield, Ralph Herbert
Foster, Robert Arnold
Fox, Charles Louis
Fox, Herman Henry
Francisco, Ferris LeRoy
French, Chapman Johnston
Fulton, William Lawrence
Gaston, Francisco Jose
Geddes, Donald Young
George, James Zachariah
Gibb, Sir Alexander
Giesey, Jesse K.
Gillen, Francis Fair
Gilman, Charles
Gladding, James Nickerson
Goss, Oliver Perry Morton
Grant, John Robert
Grant, Lloyd Murray
Gravell, William Henry
Greene, Lloyd Woolsey
Greenlaw, Ralph Weller
Griffenhagen, Edwin Oscar
Hammond, Lester Clark
Harper, Sinclair Ollason
Hatch, Everett Hamilton
Hedke, Charles Richard
Hershey, John Logan
Hinderlider, Michael Creed
Hobart, Albert Claude
Holden, Charles Alexander
Holdredge, Neil Cummings
Holmes, Hugh Browning
Horner, Wesley Winans
Houser, Shaler Charles
Howell, Cleves Harrison
Howes, Robert
Howland, William Jethro
Irwin, Orlando William
Jackson, Stuart Wilson
Jacobosky, Gilbert Garfield
Jarvis, Clarence Sylvester
Justin, Joel DeWitt
Kelker, Rudolph Frederick, Jr.
Keller, Arthur Ripont
Kelly, Edward Joseph
Kern, Joseph Francis
Knight, Seymour H.
Knowlton, Willis Taylor
Koss, George Walther
Kunkel, Julius Stephen
Lally, Thomas Edward
Lee, Charles Hamilton
Leeds, Charles Tileston
Leete, Percy Remington
Lilliestrand, Carl Emil
Lincoln, Samuel Bicknell
Linton, Walter Powell
Litter, Ferdinand Joseph
Littlefield, Myron George
Loney, Neil McIntyre
Loukes, Frank Irwin
Loughran, James Francis
McCullough, Francis Michael
McGlashan, Harry Deyoe
McGlathery, Sam Lyon
McKenzie, Andrew Jackson
Malcolm, William Duncan
Manning, James Henry
Mason, Frank Henry
Massey, George Bragg
Meyer, Adolph Frederick
Miller, Alexander Norman
Miller, Crosby
Miller, Henry Lanark
Miller, John William
Montero, Julio Daniel
Moore, William Smelsor
Moran, Robert Breck
Morris, Charles Chester
Morse, William Chester
Moses, Howard Eugene
Mundt, William Clyde
Nishkian, Leon Hagop
Ornellas, Charles Evariste d'
Orrell, James Athersmith
Osborne, Henry Zenas
Owen, Lewis Tipler
Owens, Harold Van Dyke
Park, Charles Abraham
Parker, Glenn Lane
Peck, Leon Friend
Peterson, Otto Wallace
Philbrick, Burton Garfield
Porter, John Endicott
Price, Frank Oliver
Raleigh, Wilbur Collins
Ramey, Horace Patton
Randall, Frank Alfred
Randlett, Fred Morse
Randolph, Orrin
Randolph, Richard Wood
Reed, Percy Lawrence
Reid, John Winfield
Richardson, Jeremiah Daniels
Riegel, Ross Milton
Robertson, Avalon Graves
Root, William Francis Stanton
Rose, Alexander Fraser
Rosener, Leland Sylvan
Rowe, Clarence Samuel
Sanford, George Otis
Sawyer, Philip
Scheidenhelm, Frederick William
Schultz, Charles
Sears, William Hatfield
Shafer, James Charles Forsyth
Shannon, William Day
Shaughnessy, Charles Stephen
Sims, Edward Frederick
Smith, Charles Alfred
Smith, Claiborne Ellis
Smith, Jonathan Rhodes
Smith, William Beauvais
Spaulding, Frank Alger
Spiker, Augustus Clementine
Spitzer, Felix Henry
Squire, Harry Edwin
Stander, Isaac Joshua
Stanford, Albert Franklin
Starr, Frank Charles
Stellborn, Adolf
Taylor, Walter Ludlow
Taylor, Warren Crosby
Throop, Henry Grosvenor
Todd, Edward Newton
Towne, Lockwood Jones
Van Duzer, William Albie
Van Hagan, Leslie Flanders
Vermeule, Cornelius Clarkson
Vilar y Boy, Santiago
Volck, Adalbert George
Wagner, Allan John
Walker, Charles Leopold
Walker, George Johnson
Walsh, James Joseph
Warren, Horace Prettyman
Weller, William Earl
Whiteside, Frederick William
Wilbanks, John Robert
Williams, Cyril, Jr.
Wilson, Frederick Charles
Woodyard, Jacob Frank, Jr.
Worley, Albert Harrison
Wyckoff, Charles Rapelye
Young, Alexander Rive

Current Salary Surveys in Progress

THREE SALARY surveys under Society auspices are currently "in the mill," following the completion of the Los Angeles County survey described elsewhere in this issue. Widely separated locales mark these studies—Louisiana, Maryland, and Arizona. All the studies were undertaken in response to formal requests made by public organizations, through a Local Section, for assistance in solving classification and salary problems.

Coincident with the start of the Los Angeles study, a request was received from the Louisiana State Civil Service Commission, through the Louisiana Local Section, ASCE, that assistance be given in the solution of some of its specific classification problems; that salary rates be recommended for all engineering jobs in state service; and that suggestions be made for the setting up of a comprehensive plan of examinations for engineering positions.

LOCAL COMMITTEE IN LOUISIANA

The Louisiana Local Section appointed a special Committee on Classification of Civil Engineers composed of Alvin M. Fromherz, chairman, Walter H. Scales, F. N. Billingsley, and Louis Voorhies. This committee explored the situation, laid the ground work for procedure, and is cooperating closely with the State Civil Service in the study.

In September, Allen Richmond, Assistant to the Secretary, spent a week in Baton Rouge initiating the survey. Most of the detailed work is being performed by members of the Louisiana State Civil Service staff, with short visits by Mr. Richmond as necessary. His next visit to Louisiana is planned for early February 1946.

In the spring of 1945, the Maryland State Employees Standard Salary Board, through the Maryland Local Section, ASCE, requested the Society to suggest specifications for classifications and to recommend salaries for engineering employees of the Maryland State Roads Commission (subsequently extended to include also Sanitary Engineers and Utility Engineers employed by the state). This action was pursuant to the specific provisions of House Joint Resolution No. 7, passed by the 1945 session of the Maryland General Assembly, reciting current difficulties in recruitment and authorizing a request to the Society for assistance.

This study also had to be postponed on account of the Los Angeles commitment, but late in 1945 the collection of data was begun by Chief Engineer Wilson T. Ballard, M. ASCE, of the Maryland State Roads Commission, with the assistance of Paul L. Holland, Chief Engineer of the Maryland Public Service Commission. The latter had been appointed by the Local Section as coordinator in assembling salary data. Mr. Richmond spent January 3 and 4, 1946, in Baltimore, conferring with the Highway Commission, Mr. Ballard, Mr. Holland, and others; laying out a plan of procedure; and indicating the next steps to be taken. The detailed work at the site is being performed by local personnel, all members of the Society, and will be reviewed and evaluated by Mr. Richmond. A second conference will be held late in January.

NEW SALARY CURVE IN ARIZONA

En route back to New York from Los Angeles, Mr. Richmond stopped over in Phoenix, Ariz., at the request of the Arizona Local Section, to assist in the recommendation of a new salary curve that had been requested late in November by the Arizona State Highway Commission. It will be recalled that the Society made a complete survey for the Arizona Highway Commission in 1940 (included in Manual No. 24, ASCE). The classifications recommended at that time are still in effect in the State Highway Department but the salary curve originally recommended in 1940, although amended several times in recent years, needed immediate revision to permit recruiting of urgently needed personnel.

Data collected by Wayne G. O'Harra and Earle V. Miller, Associate Members of the Society, were reviewed by Mr. Richmond and a new curve plotted and presented, with supporting data, to the Secretary of the Highway Commission.

As this is being written, it is not known what action has been taken by the commission. The action of the commission, however, is of great importance in that area, as the Highway Department is the largest employer of engineers in the state and its salary rates influence salary rates for all other engineers in the state.

The Society is glad to help in problems of this sort. It should be noted that the nature of the Society's work in such studies consists of an evaluation of the general problem, advice as to procedures, and the recommendation of measurement processes and salary curves. It attempts to clarify the thinking of all concerned with respect to the organization's problems, to point out rational approaches, and to recommend actions that should lead to reasonable solutions.

Such work does not conflict with the work of consulting firms in this field, which are prepared to carry these procedures much further—to conduct or supervise community salary surveys, to make position analyses, to write position and job descriptions, to evaluate jobs, to recommend salary rates and merit systems, and to perform any other detailed tasks desired by their clients.

It must be pointed out that the final effectiveness of the Society's salary surveys depends not on the Society itself but rather on all engineers, whether Society members or not, in the organizations and in the area affected. If they will study the details of the report, convince themselves of the correctness of the proposed solution, and become articulate in support of the recommendations before the responsible administrative agency, they can make the Society's efforts truly effective in improving the economic status of members of the profession.

Texas Section Studies Employment Conditions

A REVIEW of progress made by the Texas Section in studying and pursuing the best interests of Society members in Texas in the matter of collective bargaining was presented at the recent annual meeting of the Section. When the Section originally considered the recommendation of the Society's Board of Direction that it create a committee to act as a bargaining agency for all professional engineers in Texas, it overwhelmingly declined to take this step.

It did, however, authorize the appointment of a continuing "Committee on Employment Conditions," to become active in the interest of collective bargaining and similar matters. The Committee's long-range objectives were stated as:

1. Promotion of professional consciousness by maintenance of a living code of ethics.
2. To encourage engineer participation in public and civic affairs as a means of developing higher public esteem.
3. Rendering up-to-date advice on procedure intended to prevent an engineer from being obliged to join a labor union against his wishes.
4. Promotion of proper standards of engineering employment among employers.
5. Relentless public education intended to create an ever greater respect for the profession.
6. Establishment of better engineering education methods and curricula, together with improvements in the now hit-or-miss procedure for producing creditable professionals out of pre-professionals and engineers-in-training.
7. Tireless, relentless betterment of the Engineers' License Law, with particular emphasis on increasing its public acceptance.

During the past year this Committee has canvassed the Society membership in Texas to determine what employment conditions, if any, warrant its attention. It reported that, while the response was fairly good, the results were absolutely negative as regards revealing employment conditions or developments of concern.

As a result of these studies, Chairman Mason G. Lockwood of the Committee was "impelled to conclude that employment conditions of engineers are not deteriorating professionally in Texas. That is not to say, however, that satisfactory progress is being made. At a time of national unrest among the so-called working class, which has reached almost epidemic proportions, there has been no strong unified leadership in Texas for improved employment conditions among engineers. Salaries and other forms of compensation generally are at high levels; in fact unwholesomely high in some fields where unrestrained bidding for special talent of limited supply has produced weird conditions; yet great inequalities still exist. The rate of pay of a skilled mechanic not infrequently exceeds that of his supervisory engineer. Salaries limited by statute, ordinance or other public decree are seldom sensitive to supply and demand, individual merit, or the cost-of-living index. Creation of a higher-order public acceptance of the engineers as a vital profession would appear to be a slow but absolutely essential condition for relief from the plague of the discriminatory situation."

This summary has been gathered from the report in the November 1945 issue of *The Texas Engineer*, organ of the Texas Section.

Public Relations for Engineers

VICE-PRESIDENT Franklin Thomas, in a recent letter to the new Public Relations official of the ASCE, offered comments which are of interest to all engineers. Writing from his office in Pasadena, Calif., Professor Thomas said:

"I am very much interested in the venture of the American Society of Civil Engineers in the field of Public Relations. I believe that this step is thoroughly justified and am hopeful of encouraging results.

"For a number of years I have observed the contention of engineering groups that engineers should be accorded more recognition by the general public in the form of appointment to public positions of a policy-determining nature. These contentions have often been accompanied by complaints that the public was unappreciative of the services to society which are rendered by engineers, and it is implied that engineers should be more aggressive in presenting demands for such recognition. I am thoroughly convinced that it would be highly advantageous for engineers to be found more frequently in policy-forming groups and I am certain that such service by engineers would definitely be in the public interest. Engineers, by the nature of their training, develop an intellectual integrity which becomes inherent, and such a quality might well be generously represented where matters of public interest are under consideration. The engineer, also, by his training and activity does develop mental processes of analytical approach to new situations. This quality is highly essential to sound consideration of questions of policy.

"I do not agree in many instances with the insistence of some engineers that the desired recognition can be achieved by merely asserting that it is in the public interest. I have had some opportunity to observe the functioning of engineers in association with business men and with professional men in other fields and have come to a very definite conclusion that the most effective way for engineers to gain recognition for their profession and opportunities for public service is through the activities of individual members of the profession who have all-round qualifications sufficiently well-developed that they 'make their own way,' so to speak. I have observed repeatedly that where engineers have personal qualifications for acceptable social and personal relations with other men, associated with the intellectual abilities which we expect in successful engineers, their qualifications and usefulness are invariably recognized and they are given positions of responsibility and leadership.

"An inherent handicap to engineers in relation to other associations is the circumstance that many of the factors with which they work are material and inanimate, with definite properties, rather than personal and variable. Furthermore, the work of an engineer is often done in isolation, rather than in circumstances involving fresh contacts with human beings. These situations, accompanied by an indifference on the part of many engineers to a necessity to offset the conditions, result in the development of a type which has led to engineers being designated as 'God's frozen people.'

"Having been associated in an academic environment with young men training for the engineering profession, I have given much thought to the means whereby the personalities and interests of young men as prospective engineers could be influenced and developed. Character and ability are the basic qualifications which engineers have to offer, but personality is the quality which will serve as the vehicle whereby the other qualities may be made effective and the usefulness of the individual very greatly enhanced.

"I have a very high regard for the value of engineers to society and for the service which they do and can render, but I know that the usefulness of engineers as a whole would be greatly enhanced if they as individuals were personally equipped to make themselves felt with their respective associations.

"There are two means whereby the influence of engineers in general upon society may be increased, aside from their technical accomplishments: first, by the abandonment among engineering students of the roughneck tradition of the typical engineer's character and a substitution of an elevated and broadened interest in the finer things of life, so that they can associate among gentlemen in a creditable manner; and second, that through initiative and direct effort they participate in the various opportunities generally available to become active in community life. If young engineers more generally would qualify themselves for such participation in community interests and then would do their part in developing the contacts, there would be much less occasion for moaning that the engineer's abilities were not appropriately recognized—for through normal associations his usefulness would be apparent and his services would be called upon.

"In such a program I consider that the colleges have a major responsibility, and those members of engineering college faculties who consider that their duties have been satisfied when the technical development of the student has been accomplished, are remiss in their obligation to produce in the engineering colleges the product of greatest usefulness."

Volume of Public Construction Restricted

Comment on Public Works Received from Baird Snyder

IT BEGINS to look as if the total public construction in 1946 will be even less than anticipated in the Timing Report by the Administrator's Committee (CIVIL ENGINEERING for December 1945, page 575), according to Baird Snyder, Assistant Administrator, Federal Works Agency.

It is hard to measure the "essentiality" of public works, as everyone has his own yardstick. It appears that prices are so high, labor and materials so short, that automatically simple common sense will make the yardstick about 30 in. long.

In this event, Mr. Snyder states, the total volume of public construction in 1946 looks as though it probably would be around 19 billion, with a possibility that it may fall as low as 17, of which about 35% will be federal. This means, so far as can be seen now, that about 28% of all construction in 1946 will be public, as compared to about 22% during the 1920's and an average of 41% during the 1930's. The amount by which the 1946 percentage is below previous expectations is accounted for largely by dislocations in the professional and producing elements of the industry.

Salary Survey Completed for Los Angeles County

EARLY in December 1945, a survey of engineering jobs in the service of Los Angeles County was completed under Society auspices. Engineering job levels were established, community prevailing wages ascertained, and recommendations made for the improvement of certain personnel procedures. This survey was performed in accordance with the policy and procedures adopted in 1940 by the Society's Board of Direction, under which assistance may be given on behalf of members in the solution of problems of economic status. Obviously, the results of such activities benefit other members of the profession also.

The rise in engineering salary rates paid in private organizations during the war years, combined with a lag in the adjustment of Los Angeles County rates to correspond, had resulted in the loss of a considerable number of County employees to more remunerative jobs elsewhere in the community, and the prospect of still further losses of key personnel. Also, recruitment was being seriously hampered by current authorized salary rates.

Early in 1945, a Subcommittee on Engineering Salaries composed of County employees had been appointed by the Acting Chief Administrative Officer to give technical advice and assistance to him in engineering salary matters. The subcommittee consisted of Carl E. Arnold, Assoc. M. ASCE, Chief Deputy County Surveyor and Engineer, Los Angeles County, chairman; Finley B. Laverty, M. ASCE, Chief Hydraulic Engineer, Los Angeles County Flood Control District; Maurice C. Tobin, Assoc. M. ASCE, Civil Engineer, Los Angeles County Flood Control District; William I. Gilchrist, Civil Engineer in the County Surveyor's Department, representing the Civic Center Chapter, Engineers and Architects Association of Southern California; and W. F. Spraker of the Mechanical Department.

At the formal request of Alfred H. Campion, Acting Chief Administrative Officer of Los Angeles County, and with the approval and assistance of the Los Angeles Local Section, ASCE, under the standing procedure for such activities, Allen P. Richmond, Jr., Assistant to the Secretary of the Society, went to Los Angeles late in April 1945. His assignment was to assist the County in problems of classification and salaries for its engineering employees.

JOB LEVELS—SALARY RATES

The study began with an analysis of the situation and the material available, evaluation of the problems involved, and tentative outlining of steps to be taken in their solution, and ended with the completion of a full report. The subcommittee cooperated closely with Mr. Richmond, furnishing much valuable data, and reviewing the most important sections of the report.

In all salary problems there are two distinct variables—the relative levels of jobs, and the salary rates for those jobs. The report establishes the relative levels of 88 engineering and architectural jobs, both professional and subprofessional, in County service, and thus fixes the values of the first variable. These job levels had not been previously ascertained by a systematic method. Subsequently, the subcommittee established the relative levels of 14 more jobs, making a total of 102 separate engineering and architectural jobs in County service covering 775 authorized personnel.

In this connection, it is interesting to note that Los Angeles County has a total of more than 1,300 civil service jobs of all types with 16,000 incumbents to perform County functions within an area of 4,000 sq miles.

The Charter of Los Angeles County contains a provision to the effect that salaries paid to County employees shall be not less than salaries paid to similar employees of private persons, firms, and corporations in the area for service of the same quality, as nearly as may be determined (a similar provision is in the charter of Los Angeles City and the Los Angeles School Board).

To comply with this provision, and to solve the problem for values of the second variable at a particular moment, the Board of Supervisors of the County conducts periodic surveys of community salary rates, utilizing selected County job specifications and seeking local positions which are counterparts of County positions. Detailed salary information is collected for these counterpart positions, including hours of work, vacations, holidays, sick leave, bonus, etc. Collected data are analyzed to yield average community salary rates, generally referred to as "prevailing salaries."

SEVERAL SURVEYS PROVIDED BACKGROUND

One of these community surveys for engineering salaries had been completed by the County in April 1945. Concurrently, the Engineers and Architects Association of Southern California had also made a survey under the direction of Mr. Gilchrist, and a committee of the Local Section, ASCE, had made a check survey under the chairmanship of Mr. Laverty. Disagreement among the findings of these three surveys required close analytical study. Mr. Richmond's solution was to screen the basic data from each of the three surveys, rejecting information that could not be adequately supported, and to combine the acceptable material into a single computation. Data retained covered 2,616 employees in 148 firms and corporations. The resulting curve, smoothed out by the method of least squares, represents the prevailing salary rates for non-public engineering positions in the Los Angeles area as of April 1945.

Prior to the commencement of the survey, the Acting Chief Administrative Officer, with the assistance of the subcommittee, had worked out a partial adjustment of County engineering salary rates which was made effective by the Board of Supervisors on March 1, 1945. At the conclusion of the Society's survey it was found that the results of this partial adjustment, roughly a 10% increase over rates established prior to March 1, 1945, had approximated quite closely the prevailing rates in the community at that time. In the eight months that had elapsed since that adjustment, however, there had intervened V-E Day, V-J Day, and the incidence of reconversion to peacetime activities, so that the March 1, 1945, rates were clearly obsolete for 1946 use.

SALARY RATES TO BE DETERMINED

The Society's survey established the relative level of jobs (which should not have to be further disturbed except to correct errors or to reflect changes in duties), and also ascertained the salary rates that were being paid for them in the spring of 1945. To this salary datum may be applied differentials to be determined by subsequent community surveys, to compute appropriate salary rates at any time in the future. For example, late in 1945 the County, the City of Los Angeles, and the City School Board were jointly engaged in making a general community salary survey, which included a few key engineering positions to assist in determining current differentials. Additional data are being collected by the County in the effort to find what salary rates must be paid in 1946 to hold its engineering organization together and recruit badly needed new personnel.

A third phase of the report involves the listing and discussion of factors to be considered in fixing salary rates for public organizations, particularly Los Angeles County. The fourth and final portion of the report includes recommendations for improvement of certain personnel procedures in County service.

It had been estimated that the survey would require about eight weeks, but before it was completed 31 weeks had elapsed. A report was submitted to the Chief Administrative Officer of the County, Brig. Gen. Wayne R. Allen, on December 4, 1945, which will be printed by the County. The Society has ordered 400 additional copies for Society use and for sale.

The text of the Los Angeles report will contain about 10,000 words, supplemented by 16 appendixes (about 40,000 words) 7 figures or charts, and 26 tables. Much of the material will be useful in the solution of engineering classification and salary problems elsewhere.

Since submission of the report on December 4, the County Board of Supervisors has authorized a 5% increase in the salaries of all engineering employees whose rates were below the prevailing salary rates as of April 1945, which is merely an adjustment to the datum. The Board also granted rates of approximately $10,700 per year to the heads of five engineering departments. No action has yet been taken to raise engineering salaries above the April 1945 prevailing rates except in the case of these department heads, but the Board has instructed the Chief Administrative Officer to report on salary rates for all positions in County service for further consideration.

Harza Latin-American Junior Awards

A GROUP of awards in the form of entrance fees for Juniors joining the Society was established in 1945 by L. F. Harza, M. ASCE, who presented $1,600 in cash to the Society for this purpose. This fund and the income from it are to be used until exhausted to pay the entrance fees for Junior membership in the Society, first year's dues, and Society badge for selected qualified engineer graduates of Latin-American universities. No more than eight such memberships are to be awarded in any one year nor more than two to graduates from any one country.

Candidates for Junior membership are to be proposed by appropriate faculty heads of the several schools. Selection of candidates is to be made for outstanding scholarship, personality, and interest in Pan-American affairs. To receive consideration by the Society, each candidate proposed is required to submit application for Junior membership on the standard form, and he must meet all requirements for Junior membership in the Society. Each candidate who is proposed by his university and who makes application is to be interviewed by one or more Corporate Members of the Society selected by the Board of Direction. If, on application, the selected candidate is found by the Board to be qualified for Junior membership, his entrance fee, his first year's dues, and the cost of his Society badge will be paid from the fund here described, and he will be notified of his election as a Junior.

Postwar Planning Is Advanced in Texas

RESULTS of a year's activity in the field of postwar construction are noted in the final report of the committee of the Texas Section, printed in the November issue of *The Texas Engineer*, publication of the Society's Texas Section. From this report some of its important features have been abstracted in the following paragraphs. The report itself was submitted by Uel Stephens, who was chairman of the Texas Section Committee on Postwar Planning and Economic Development. According to Mr. Stephens, one of the outstanding features of the committee's activities is the fact that each member was active on committee work throughout the year rather than, as in most committees, only at special meetings, usually just once during the life of the committee.

As the committee planned its work, it laid out a program that was designed to accomplish the best results, by concentrating on three features:

1. Cooperating with other similar organizations.
2. Keeping public officials constantly conscious of the need for plans.
3. Creation of a State Planning Board.

In reaching its objectives, the committee received assistance from the daily press and from state departments. Its most comprehensive activity, carried out in cooperation with the Southwest Section of the Associated Municipal Contractors, was to conduct a state-wide survey to determine the plans and needs of every incorporated municipality in Texas in regard to its postwar problems. A report form was developed and 3,000 sets were distributed to 530 towns and cities. While the extent of the replies was somewhat disappointing, information was received from 47 communities with respect to 226 projects having an estimated construction cost of over 150 million dollars. Some of these projects were much more comprehensive than appeared, being composed of a number of individual items, some of considerable size. An alarming feature of the survey was that for only 35 projects valued at $11,000,000 were the plans actually completed.

As a final thought, Mr. Stephens and his committee emphasized to the Texas Section that planning for a public works program can best be done by a real State Planning Board. They feel that no better program for the Section could be adopted than one advocating the creation of such a board.

Dr. Vannevar Bush Wins Washington Award

THIS year's recipient of the Washington Award is Dr. Vannevar Bush, president of the Carnegie Institute of Washington and wartime head of the Office of Scientific Research and Development. The award will be presented at a dinner in Chicago on February 20, sponsored by the Western Society of Engineers.

Founded in 1916 by John W. Alvord, of Chicago, the Washington Award is administered by the Western Society of Engineers on the recommendation of a commission representing the Four Founder Societies and the Western Society of Engineers. Previous recipients include Herbert Hoover, Orville Wright, Michael Pupin, and Ralph Modjeski.

Dr. Bush was born in Everett, Mass., in 1890, and educated at Tufts College, the Massachusetts Institute of Technology, and Harvard University. From 1919 to 1938 he was on the M.I.T. faculty—from 1932 on in the capacity of vice-president and dean of engineering. Since 1939 he has been president of the Carnegie Institute of Washington, and in 1940 President Roosevelt appointed him head of the Office of Scientific Research and Development. In the latter capacity he was prominent in the researches leading to the development of radar and the atomic bomb, and was one of the group of scientists invited to view the detonation of the first atomic bomb in New Mexico.

Report of Committee on Education

DURING 1945, the Society's Committee on Education, in continuation of its previous activities, made a survey of membership opinion on the educational needs of civil engineers. A questionnaire, designed by the Cooperative Committee in Civil Engineering Education of the Society for the Promotion of Engineering Education, was sent out to 2,700 corporate members of the ASCE. Active interests in the subject of education was demonstrated by the fact that 38% of those receiving this rather long questionnaire took the time to complete it.

Majority opinion rated the graduates of the past ten years as poor in ability to write a clear and orderly letter or report, or to address a gathering. Also, majority opinion accused these graduates of showing little interest in public affairs. They were however rated high in accuracy, fairness, diligence, and dependability. Little fault was generally found with their ability to get along with people, capacity for leadership, and grasp of engineering fundamentals. Detailed opinions on desired curricula for civil engineering students were voiced, and the committee believes that these reinforce the subdivision of time recommended for a four-year curriculum in the committee's 1944 report. This subdivision is as follows:

Humanist—social subjects	20%
Physical sciences, including geology	15%
Drawing	4%
Mathematics (excluding trigonometry)	10%
Mechanics, hydraulics, and strength of materials	11%
Engineering subjects other than civil	10%
Civil engineering subjects	30%

The complete results of the questionnaire are given in the 1945 report of the ASCE Committee on Education, which, together with the 1944 report, is planned for publication in full in an early issue of PROCEEDINGS.

The Engineer in Foreign Service

XXVIII. "King of the North"

By KENNETH E. RISTAU, JUN. ASCE
LIEUTENANT COLONEL, 331ST ENGINEERS CONSTRUCTION BATTALION

Look on the map of Alaska on the end of the Seward Peninsula about 80 miles northwest of Nome and you will find Pt. Spencer. When I arrived the middle of June, and landed on the beach, the entire bay was still frozen over. Our first boat crashed through the ice on June 28. There wasn't a thing here and the first items to hit the beach were our bulldozers. Then we proceeded to build our tent camp for the troops, get the airfield rolling, and build the permanent buildings, complete with utiladors.

I was very lucky in the way the job was set up in that I am Area Engineer and also Post Commander. We make our own design decisions, administer the engineer and attached troops, and worry over our supplies—which is rough since we are on the end of the supply chain and both transportation and communication are difficult. My friends back in the Aleutians refer to me as "King of the North." What a kingdom!

One of the big bagaboos here is Permafrost. On top the ground is soft and spongy, the tundra being soaked with water, and anywhere from 12 to 36 in. below the surface you hit frozen ground that is frozen to depths of over 200 ft. Surest way to get into trouble is to disturb the surface because then the ground below thaws; you remove that and the cycle repeats. Our biggest problems are building roads, driving piles, and developing water supplies. Among the unusual items are two dog teams and a team of packdogs. Have a picture of one dog loaded up with light stuff like sleeping bags, and it looks like a luggage pile sliding on rollers.

Our reliable transportation here is the "cat"-train, which usually consists of 5 D-6 or D-7 widetrack "cats" towing sleds or Athey track trailers.

On top of it all you have your perverse weather. I made one trip recently in little hops traveling by tugboat, barge, float plane, "cat" train, wheel plane, "weasel," and on foot where at one spot I was weathered in for five days. (*Abstracted from the "Tennessee Valley Engineer" for October 1945*).

News of Local Sections

Scheduled Meetings

CINCINNATI SECTION—Joint meeting at the University of Cincinnati on March 1, at 8 p.m.

CLEVELAND SECTION—Dinner meeting at the Cleveland Engineering Societies Club on February 15, at 6:30 p.m.

COLORADO SECTION—Dinner meeting at the Oxford Hotel on February 11, at 6:30 p.m.

DAYTON SECTION—Luncheon meeting at the Engineers' Club on February 18, at 12:15 p.m.

FLORIDA SECTION—Dinner meeting at the Seminole Hotel on February 1, at 7 p.m.

IOWA SECTION—Technical meeting at the Hotel Fort Des Moines on February 20, at 7:30 p.m.

MARYLAND SECTION—Dinner meeting at the Engineers' Club on February 20. Cocktails at 6 p.m.; dinner at 7 p.m.; and meeting at 8 p.m.

METROPOLITAN SECTION—Technical meeting in the Engineering Societies Building on February 20, at 8 p.m.

NORTHWESTERN SECTION—Dinner meeting at the Minnesota Union on February 4, at 6:30 p.m.

PHILADELPHIA SECTION—Social meeting at the Engineers' Club on February 16, at 6:15 p.m.

ST. LOUIS SECTION—Luncheon meeting at the York Hotel on February 25, at 12:15 p.m.

TENNESSEE VALLEY SECTION—Dinner meeting of the Knoxville Sub-Section at the S & W Cafeteria on February 13, at 6 p.m.

TEXAS SECTION—Luncheon meeting of the Dallas Branch at the Adolphus Hotel on March 4, at 12:15 p.m.; luncheon meeting of the Fort Worth Branch at the Blackstone Hotel on February 11, at 12:15 p.m.

TRI-CITY SECTION—Dinner meeting at the Blackhawk Hotel on February 14, at 6:30 p.m.

Recent Activities

ARIZONA SECTION

The annual fall meeting of the Arizona Section took the form of an all-day session, held in Phoenix on November 24. During the business meeting in the morning the following officers were elected for the coming year: George T. Grove, president; Lawrence Dail, first vice-president; Walter Johannessen, second vice-president; and John A. Baumgartner, secretary-treasurer. Later the group adjourned for a joint luncheon with the Phoenix chapter of the Arizona Association of Engineers, at which John A. Carollo gave a talk on the powerful new insecticide, D.D.T., explaining its history, uses, and limitations. The speakers scheduled for the afternoon technical session were Richard Bennett, city engineer of Phoenix, who discussed the possibilities of small hydraulic power plants in Arizona; A. L. Moriarity, vice-president of the Central Arizona Light and Power Company, whose subject was "The Economic Development of Arizona"; Col. Rufus W. Putnam, district engineer for the U.S. Engineer Office at Los Angeles, Calif., who outlined the preliminary studies for flood control on the Gila River; and S. F. Turner, district engineer for the Ground Water Division for Arizona at Tucson, who described the Verde River ground-water survey. A dinner at Johake Inn for the members and their wives brought the day to a happy end.

CENTRAL ILLINOIS SECTION

At the annual dinner meeting, held on December 5, members of the Central Illinois Section elected the following new officers for 1946: T. C. Shedd, president; L. E. Philbrook, first vice-president; W. M. Lansford, second vice-president; and Ralph B. Peck, secretary-treasurer. The technical program consisted of a talk by Col. H. W. Hannah, director of the University Division of Special Services for War Veterans. Colonel Hannah discussed his experiences in the airborne invasions of Normandy and Holland, with particular emphasis on the engineering aspects of those operations.

CENTRAL OHIO SECTION

"Use of the Coordinate System in Mapping" was the topic of discussion at the November meeting of the Section, the speaker being Oscar J. Marshall, professor of civil engineering at Ohio State University. The speaker at the December meeting was Johnnie Jones, newspaper reporter and columnist, who gave a humorous talk on his experiences and described construction projects of interest to engineers. During the evening the following officers were installed for the coming year: Nye Grant, president; George E. Large, first vice-president; Carl C. Walker, second vice-president; and Clarence D. Bowser, secretary-treasurer.

CLEVELAND SECTION

At its December meeting the Cleveland Section unanimously went on record as favoring the Magnuson Bill. A talk on "Welding on Large Structures" comprised the technical program. This was given by Robert Kinkead, consulting welding engineer, who supplemented his remarks with the Lincoln Electric Company's film on shrinkage and how to control it in the welding process. The importance of proper welding sequence was stressed, as improper procedures will cause distortion in the welded structure. Examination of many of the failures of all-welded bridges in Europe show that the failure took place in the parent metal and not in the weld metal, Mr. Kinkead pointed out.

COLORADO SECTION

An interesting program had been arranged for the annual "Ladies' Night," which was held on December 10. Following dinner, a sound motion picture, entitled "Music in the Skies," was shown through the courtesy of the Westinghouse Company. Presenting a program broadcast by N.B.C., the film showed the various steps and equipment necessary to get the broadcast into a home receiver. The speaker of the evening was Dick Isaacs, district representative for the Westinghouse Company, who discussed the availability of home appliances, stressing the fact that most of them will not be on the market in any quantity before the second quarter of 1946. During the evening the new officers for 1946 were introduced. These are J. E. Warnock, president; Russell James, vice-president; and Alfred J. Ryan, secretary-treasurer.

CONNECTICUT SECTION

Part of the November meeting of the Connecticut Section was devoted to discussion of the subject of sponsoring an informal counseling service for returned veterans who are either graduate engineers or interested in making engineering their life work. It was finally decided to authorize the president of the Section to inaugurate such a service at his discretion. The meeting was then addressed by Oscar L. King, director of the Society's Committee on Postwar Construction, who outlined the cooperative action of his committee and the Committee for Economic Development.

FLORIDA SECTION

Members of the Section entertained the ladies of their families at the meeting held on December 7. During the annual election of officers, Harold A. Scott was chosen president and Harold D. Van Vranken, secretary-treasurer. One of the features of the occasion was the presentation of certificates of life membership to John R. Wilbanks, of Sarasota, and Percy L. Reed, of Gainesville. Presentations were made by Alfred F. Harley, himself a life member as well as the oldest member of the Section, with which he became connected in 1898.

INDIANA SECTION

On November 30, members of the Indiana Section were in joint session with the Indiana Engineering Council and the Indiana Society of Professional Engineers in Indianapolis. At the banquet held that evening a certificate of life membership in the Society was presented to William Moore. Numerous committee reports were read at the business meeting held the next morning. During the latter session the following officers were unanimously elected for the coming year: R. B. Wiley, president; L. S. Finch, vice-president; and B. A. Poole, secretary-treasurer.

ITHACA SECTION

The December meeting of the Section—held in Elmira, N.Y., on the 10th—took the form of a joint session with local groups of the A.S.M.E., the A.I.E.E., the Society of Professional Engineers, and the Society of Automotive Engineers. The popular subject of atomic energy was the topic of discussion, the principal speaker being Prof. R. C. Gibbs. Professor Gibbs, who is chairman of the Department of Physics at Cornell University, explained the conditions necessary for the release of atomic energy and demonstrated the procedure with cleverly arranged models. An animated discussion from the floor concluded the program.

KANSAS CITY SECTION

The subject of what the Juniors desire and expect of the Section was discussed by nine Juniors at the November meeting of the Section. It was the consensus of opinion that many illuminating and helpful points were made in the course of the discussion. The group then heard Col. J. F. Brown speak on "Port Development at Army Bases in the Southwest Pacific Area." The annual election of officers, which took place at the December meeting, resulted as follows: John C. Long, president; Sam Callahan, first vice-president; Ansel N. Mitchell, second vice-president; and Josef

Sorkin, secretary-treasurer. Another feature of the occasion was the presentation of certificates of life membership to W. H. Bosier, H. H. Fox, and A. R. Young, the latter in absentia. Maj. Gen. L. J. Sverdrup was then introduced and spoke interestingly on military construction in the Pacific. Later General Sverdrup showed colored motion pictures that he had taken in New Guinea and presided at a question-and-answer period.

Los Angeles Section

On November 14, the Section sponsored one of the most successful "Ladies' Nights" in many years, the attendance numbering over 200 members and their wives. The colorful program, dealing with the "lands south of the Border," included sound motion pictures on the Central Railroad of Peru and the Cerro de Pasco Mines, and a group of songs and dances presented by members of the Mexican colony in Los Angeles. The December meeting constituted an innovation in that an all-day technical meeting preceded the dinner in the evening. The papers covered a wide range of subjects, the sections represented being Soil Mechanics, Sanitary Engineering, Hydraulics, and Structural Engineering. Of particular interest was the talk by Albert P. Gildea, hydraulic engineer for the U.S. Engineer Office at Los Angeles, who spoke on "Superelevated Flow in Curved Open Channels," illustrating his talk with colored motion pictures of the Hansen Dam experiments. The installation of the newly elected officers for 1946 concluded the program. These are Wallace Chadwick, president; C. Ross Compton and Trent R. Dames, vice-presidents; and David M. Wilson, treasurer.

The Junior Forum met on December 12 to hear Lt. Col. DeWitte C. Butz describe his engineering problems and experiences under fire. Colonel Butz, now building structural engineer for the Los Angeles Department of Building and Safety, spent many months in combat in the South Pacific Area. The annual election of officers for the Forum, held at this time, resulted as follows: John E. Combs, president; Houston L. Standefer, vice-president; and Donald F. Warren, secretary.

Maryland Section

Guests of honor and speakers at the December meeting of the Maryland Section were Col. W. N. Carey, Secretary and Executive Officer of the Society, and Gail A. Hathaway, Director of the Society. In his talk Colonel Carey emphasized the changes that have taken place in the work of the Board in the past twenty years, noting particularly the present-day emphasis on welfare activities as contrasted to the purely scientific attitude of years past. Mr. Hathaway then spoke of his recent experiences as a civilian adviser in the European Theater of War. Of special interest was his account of setting up a flood-forecasting system for the Rhine River in an attempt to forecast river stages ten days in advance. During the evening Norman D. Kenney was elected president, and Robert M. Reindollar, vice-president for the coming year.

Metropolitan Section

A "Report on the Army's New York Port of Embarkation" was the feature of the December meeting of the Metropolitan Section. This was given by Maj. Gen. Clarence H. Kells, commander of the New York Port of Embarkation, who gave an illuminating talk on the expansion of the Army's greatest port of war, its wartime role as an advance supply base for the armies of General Eisenhower, and its present task of bringing over two million men back to this country. "Streamlining Building Construction Through Modular Design" was discussed by A. Gordon Lorimer at the meeting held on January 9. Mr. Lorimer supplemented his talk with a demonstration of how the various misfit building products of the past may be coordinated for economic and trouble-free assembly in the building of today.

Michigan Section

On December 14, members of the Michigan Section heard A. C. Eichenlaub speak on "Modern Trends in Portland Cements." Mr. Eichenlaub, who is chief chemist and assistant works manager for the Peerless Cement Corporation, reviewed the fundamental changes made in the manufacture of Portland cements in recent years, pointing out the significance of fineness and the use of air-entraining agents at the present time. During the business discussion the Section went on record as opposing passage of the Kilgore Bill and recommending, in its stead, consideration of the Magnuson Bill.

Mid-Missouri Section

Members of the Mid-Missouri Section met at the Missouri School of Mines at Rolla on November 27. The list of speakers for the occasion included Harry F. Thomson, Society Director from District 14, who discussed the coordination of the Local Sections with the Student Chapters and reviewed the problems of the young engineer; Allen G. Hely, assistant hydraulic engineer for the U.S. Geological Survey, who discussed the survey for a slope-area computation of peak discharge of the flood at Newburg Branch, Mo., on June 8, 1945; and Lt. Col. Machin, of the Corps of Engineers, U.S. Army, who described the many and various types of construction performed by the engineers and explained some of the methods devised for special jobs of unusual character.

Mid-South Section

The Mid-South Section held its annual meeting at Little Rock, Ark., on December 10. During the business session, Lt. Col. George R. Schneider was elected president of the Section for the coming year; George L. Koomos, vice-president; and Ben Dees, secretary-treasurer. Another feature of the occasion was the presentation of certificates of life membership to A. E. Spiker, William E. Elam, Albert F. Stanford, and F. I. Louckes. At noon A. J. Boase, manager of the structural bureau of the Portland Cement Association, Chicago, Ill., addressed a joint luncheon of the Section and the Little Rock Engineers Club on the tremendous building program in progress in South America. "They are using the most advanced methods in designing with no structural steel, using the reinforced concrete instead," he pointed out. Other speakers were P. W. Simms, head of the Soils and Pavement Section of the U.S. Engineer Office at Little Rock, and Roland Vokac, technical adviser of the Berry Asphalt Company, Chicago, Ill.

Oregon Section

At the meeting held on December 6 Society President J. C. Stevens was asked to explain the aims and activities of the Oregon Museum Foundation, Inc. The organization is planning to build a museum for the preservation of Oregon historical records and for study of the natural sciences of the state. An illustrated lecture on "Building a Concrete Drydock by Open Caisson Methods" comprised the technical program. This was given by F. A. Banks, regional director for the U.S. Bureau of Reclamation at Coulee Dam, Wash., who described in detail the building and placing of the caisson and the problems encountered in the selection of the proper site.

Sacramento Section

Outstanding among the recent technical meetings held by the Sacramento Section was a joint session with local groups of the Society of American Military Engineers and the American Chemical Society. On this occasion a talk on the atomic bomb and the Hanford Project was presented by Col. Franklin T. Matthais, commanding officer of the Hanford Engineer Works. Colonel Matthais gave background material on the atomic bomb and described its construction in general outline. The 22d Annual Christmas Jinx, on December 18, attracted a record attendance of 400. The program highlighted the "Postwar Daze" of civil engineers.

San Francisco Section

The Section's Committee on Soil Mechanics and Foundations was in charge of the technical program for the December meeting of the Section. The principal paper, entitled "Experiences with Predetermining Pile Lengths," was presented by W. W. Moore, San Francisco consultant and a member of the Section's Soil Mechanics Committee. In an introductory talk Charles H. Lee, chairman of the committee, pointed out the innumerable uses of soil mechanics in the design of structural foundations, in the construction of aviation landing fields and military roads, and in salvaging operations at sea. Salvaging operations at Pearl Harbor, for instance, were guided by the friction circle stress analyses of the soil in which the hulls were embedded. This was made possible by laboratory testing of undisturbed samples obtained from submarine borings. From these analyses, supplemented by model tests, were determined the pull which would

develop during turning or lifting operations and the possibility of unexpected movement of the hull.

Syracuse Section

Certificates of life membership in the Society were presented to three members of the Syracuse Section at the meeting held on December 12. The recipients were Harold V. Owens, Frederick C. Wilson, and Henry G. Throop. The latter gave a brief talk on some of his engineering experiences in the past quarter of a century. The technical program for the occasion consisted of the showing of a Seabee film on the construction of air bases. Following the showing of the film, many of the veterans present took part in a general discussion of the type of work illustrated.

Tacoma Section

Part of the November meeting of the Tacoma Section was devoted to business discussion and the reading of committee reports. A technical program, consisting of the showing of Army, Navy, and Marine Corps films of landing and fighting on Okinawa and Iwo Jima, had been arranged by R. W. Lemon, director of the Fort Lewis Film Library.

Tri-City Section

A dinner meeting of the Tri-City Section was held in Moline, Ill., on December 13. Following a business meeting, the speaker of the evening, Comdr. P. W. Roberts, was introduced. Commander Roberts, who is officer in charge of the Central Parts Warehouse at Joliet, Ill., discussed the history and activities of the Seabees. A film was shown in connection with his talk.

Wisconsin Section

An interesting program of speakers had been scheduled for the November 28 meeting of the Wisconsin Section. The list included Maj. Jesse C. Dietz, who discussed, with the aid of slides, the procedure of construction and maintenance of advanced air bases in England and on the Continent in the crucial period following the D-day landings in Normandy; Joseph A. Liska, who told of the critical housing problem in England and on the Continent, describing the various types of low-cost housing that have been developed; and W. H. Zamzow, who described his experiences with a Seabee battalion in Hawaii on air-base construction. During the evening the annual election of officers was held, with the following results: Lloyd D. Knapp, president; Edward H. Schmidtman, first vice-president; James G. Woodburn, second vice-president; and Charles W. Yoder, secretary-treasurer.

Student Chapter Notes

Georgia School of Technology

Highlight of the fall season for members of the Georgia School of Technology Chapter was an inspection trip as guests of the Plantation Pipe Line Company. Buses were provided to carry the students and members of the Georgia Section from Atlanta to stations at Doraville, Austell, and Bremen. Everyone enjoyed the jovial "bull session" while in transit and the refreshments served at each stop. The stations themselves proved to be most interesting as did the explanatory talks given by members of the staff of the Plantation Pipe Line Company. The perfect end to the day came in the form of a delicious barbecue served at the Bremen Station Park, music for the occasion being supplied by local talent. Arrangements for the Chapter were made by Faculty Adviser Ralph B. Black and Paul Weir, chairman of the Georgia Section's Entertainment Committee. C. R. Younts, president of the Plantation Pipe Line Company, and H. B. Britton, general superintendent, acted as hosts.

Members of Georgia School of Technology Chapter Are Guests of Plantation Pipe Line Company

Ohio State University

The Student Chapter at Ohio State University announces that it was reorganized on November 19, 1945, after almost two years of inactivity necessitated by the greatly reduced civilian enrolment. The Chapter has already arranged a program for 1946 and elected officers as follows: Edward Kimmick, president; Herbert Long, vice-president; and Dale Wilkins, secretary-treasurer. Evidence that the activities of the Chapter have gotten under way in earnest is shown in the fact that it has already issued one of its traditional quarterly news bulletins.

Members of the Recently Reorganized Chapter at Ohio State University

Stanford University

The Stanford University Student Chapter has completed an active fall semester. On October 29 Samuel B. Morris, chief engineer and general manager of the Los Angeles Water and Power Department, addressed the first social meeting of the season on the subject of the young engineer in public service. The term ended with an initiation and 25th anniversary banquet in Palo Alto on November 20. Speaker of the evening was L. A. Elsner, manager of the San Francisco office of the Chicago Bridge and Iron Company, who discussed the part that imagination must play in structural design. A high point of the evening was the reading of a letter from President Stevens commending the Chapter. This is the seventh time the Chapter has been thus honored. The list of present officers is as follows: Channing Cathcart, president; Lawrence Ames, vice-president; John Olson, recording secretary; Wesley Risling, corresponding secretary; James Wilcox, treasurer; Fabian S. Miller, Contact Member; George E. Solnar, Jr., Junior Contact Member; and Harry A. Williams, Faculty Adviser.

University of California

On November 30 the University of California Chapter held its organization meeting for the term, the principal speaker being Comdr. Carl J. Vogt, who has just returned to resume his duties as professor of mechanical engineering. The bound copy of the Chapter report for the calendar year 1944 was on display, together with the President's Letter of Commendation. Earlier in the season 21 members of the Chapter were guests of the San Francisco Section on an excursion to the U.S. Naval Drydocks at Hunter's Point. The officers for the fall term are Norman Murdoch, president; Albert J. Korsko, vice-president; J. Caldera, secretary; and Bernard M. Auld, treasurer.

ITEMS OF INTEREST

About Engineers and Engineering

Construction Volume and Prices Linked

ECONOMIC forces of price control have shown that they are still operative in the construction industry, according to Maj. Gen. Philip B. Fleming, M. ASCE, Administrator of the Federal Works Agency. This situation was shown clearly in the bulletin, "Construction Materials and Public Construction Summary, No. 29" compiled by the FWA. General Fleming's foreword in this publication is so pointed that it is here reprinted.

"The dollar volume of construction activity through the autumn of 1945 has remained at a relatively stable level of slightly more than $425,000,000 a month. Increases in non-military construction have just about compensated for the decline of military construction.

"This seems to me to constitute an adequate answer to those who feared that the elimination of War Production Board controls over building materials would result in sharply rising prices that would severely penalize both the construction industry itself and the consuming public.

"Apparently economic forces in this field have performed the role expected of them: when prices threatened to soar to unjustifiable heights, potential purchasers of the products of construction simply refused to sign contracts; when materials and labor leveled off at reasonable prices, contracts were again entered into.

"In other words, the American people have shown commendable restraint, and this has been particularly true of the contracting officials of state and local governments. Whereas private commercial construction in November was six and a half times what it was a year ago, private industrial construction about three times, and residential over twice as much, nonmilitary public construction is up only 10%.

"State and local governments have completed detailed plans for more than a billion dollars worth of public work, yet there was no mad scramble to get work under way immediately after the surrender of Japan, a scramble which, because of the then-existing shortages of labor and materials, inevitably would have stimulated the forces of inflation. All the evidence indicates that only the most urgently needed public works are being let to contract, thus helping to keep construction volume in line with available resources in labor and materials.

"Construction now approaches its customary winter decline. The coming spring should find us equipped with far richer resources, and better and more abundant plans, from which to provide the common facilities which the people want and need. Even then, however, I hope that we shall not relax our present caution. The incidence of unemployment in each community and prevailing price levels for materials together should furnish the best clue to the intelligent timing of public contracts.

"By continuing to exercise reasonable restraint we can look hopefully forward to a rising volume of construction under conditions that will assure to the consumer—individual or public agency—a sound product worth what it costs."

N. G. Neare's Column

Conducted by

R. ROBINSON ROWE, M. ASCE

HALF OUR service members were back and many attended the February meeting of the Engineers Club. It was great to see them again, to hear their stories and share their gripes. There was C. Black, one of the Seabees that was stevedoring a keg of beer on Cebu last August, griping about the fiasco of postwar planning. "You fellows thot that all we wanted was a job to come home to," he charged. "Now I've got 14 jobs to choose from in towns with no houses and I can't buy a pair of pants. The Army Joe's are dyeing their uniforms to dark grays, but you can't do that to a monkey suit."

"And we'll miss them in the parade next November," added Professor Neare. "Speaking of parades, what was the strength last November that marched 11 abreast to fill all ranks?"

"The data were conflicting," complained Joe Kerr. "If E is the number of Engineers and S the number of Seabees, then the conditions can be written in order: $E = 11a$, $S = 11b$, $S = 8c$, $E = 8d + 1$, $E = 7e$, $S = 7f + 1$, and then 14 more equations in pairs like the last two, including $E = 2g$. This last doesn't agree with the fourth; E is either odd or even, but not both. I suppose there is some rule about file closers, which I don't know, so I give up."

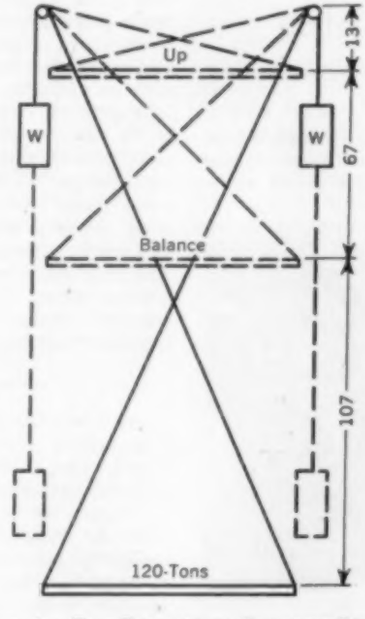


FIG. 1. THE DYNAMICAL BALANCE LIFT BRIDGE

"Not file closers, but rhetoric," suggested Cal Klater. "The last 14 conditions were stated in the last of 3 correlative clauses introduced by 'similarly.' Joe inferred similarity to the second clause only, forgetting the first. The inference should be similarity to both first and second, which is possible to this degree: if S and E are divided by 2, one division will be exact and the other will leave a unit remainder; likewise for divisors 3, 4, 5, 6, 9, and 10.

"If $S = 8c$, it cannot leave a unit remainder when divided by 2, 4, 6, or 10; therefore S contains these as factors, and also the sub-factors 3 and 5. Containing 3, S divided by 9 cannot leave a unit remainder, so must contain 9. Hence the conditions may be tabulated:

MEN ABREAST	LEFTOVERS: ENGINEERS	LEFTOVERS: SEABEES
2	1	0
3	1	0
4	1	0
5	1	0
6	1	0
7	0	1
8	1	0
9	1	0
10	1	0
11	0	0

and the answer is 13,321 Engineers and 11,880 Seabees."

"Your rhetoric equals your arithmetic, Cal. Generally, 27,720 can be added to either number any number of times, but your answer is the simplest. Guest Professor Stoop Nagle has a new problem which will give you bridge engineers something to worry about."

"It's a new application of the dynamical balance to accelerate the operation of lift bridges, Noah. This elevation (Fig. 1) of deck, rigging, and counterweights has all the data. When the deck is in the 'balance' position, the system is stable. Initially the deck was hauled down and pinned at roadway level. To open the draw, the deck was unpinned so that it swung to a stop at the 'up' position, where it had to be pinned until time for closing. Then it was swung down in similar position, a little power being needed to overcome friction during each swing. How heavy are the counterweights?"

Only four Cal Klaters this month: Isidore Knobbe (Jos. S. Lambie) Richard Jenney, Lawrence E. Goodman and O'Kay (Otto H. S. Koch). The Guest Professor is John L. Nagle.

Report on Philadelphia Water Supply

DEFINITE progress toward the solution of the great problem of modernizing and amplifying the water supply for Philadelphia is indicated in a recent report by an eminent consulting board to the city. Following authorization in August 1945, the Board has been busy on field inspections, water analyses, and technical studies of the various possible sites and sources. Part 1 of its report has now been made public.

As a basis for its consideration, the Board recommended a supply of 500 mgd, sufficient for 2,400,000 persons. This is estimated to provide for contingencies up to the year 2000. All the sources under consideration were north of the city, of which that on the Perkiomen Creek, a tributary to the Schuylkill River, was relatively close. Others were in the upper Lehigh Valley and on the Delaware north of the Water Gap. In all instances, provision was included for releasing compensation water as now required by law.

As a result of all these studies, the Board concluded that the most desirable plan involved a dam on the Delaware near Wallpack Bend above the Water Gap. From this point the outflow would utilize the river channel for many miles, to Yardley, just above Trenton, where it would be diverted and later filtered. No supply would then be needed from the Schuylkill, and this source would be abandoned. The plan would have the additional advantage of utilizing existing filtration facilities.

This general plan, known as the Yardley-Wallpack Bend project, is the one favored by the board as fitted to "best serve the future needs of the city, in the event it is later desired to abandon existing sources of supply." Part 2 of the report, now in preparation, will go into further technical studies, cost estimates, and recommendations regarding the present sources and systems, including relation to the sewage problem.

The present report covers over eighty typed pages, supplemented by about 60 large charts, tables, maps, and other data. It is signed by the Board of Consulting Engineers, Philadelphia Water Commission, consisting of Charles A. Emerson, Francis S. Friel, Nathan B. Jacobs, Joel D. Justin, and Gustav J. Requardt, all members of the Society. William D. Williams is Executive Engineer. The report is on file in the Engineering Societies Library, in New York.

Society Member Honored by the Moles

THE Moles, a New York organization of tunnel and heavy construction men, have announced their member and non-member awards for 1946, given each year for "outstanding contributions to construction achievement." The member award goes to Miles I. Killmer, also a member of the Society; the non-member award to Oscar W. Swenson, pioneer railroad builder.

Mr. Killmer is vice-president and general manager of the Mason and Hanger Company, New York contractors. Over a period of forty years, dating from the construction of the Pennsylvania Railroad tunnels under the East River, New York, in 1906, and extending to the present-day project of completing the Brooklyn-Battery Tunnel, Mr. Killmer has few rivals in length and variety of experience in subaqueous tunneling under compressed air. He has been engaged as a construction specialist on most of the under-river tunnels for rail or vehicular transit in the metropolitan district of New York, including the subways linking Manhattan and Brooklyn and tunnels between New York and New Jersey.

MILES I. KILLMER
Winner of the Moles Award

Presentation of the awards will be made at a dinner meeting, to be held at the Roosevelt Hotel in New York on February 6.

Chairman of Engineers Joint Council Honored

OF INTEREST in connection with the report of the National Engineers Committee of the Engineers Joint Council on the "Industrial Disarmament of Aggressor States (Germany)" (which appeared in CIVIL ENGINEERING for November 1945, page 524) is the fact that the chairman of the Council, Robert E. McConnell, of New York, recently received the War Department Certificate of Appreciation. This reads:

"For service of exceptional merit in the National Defense and in the prosecution of the war against Germany for the period from December 1944 through August 1945. As Chairman of the Engineeers Joint Council, he was primarily responsible for the preparation of a report to the War Department on the methods to be used and the steps to be taken in the industrial disarmament of Germany and in the destruction of her war potential. Assigned a position of great responsibility by the War Department in the recruiting of industrial and engineering personnel for service in Germany, Mr. McConnell succeeded in enlisting the services of a large number of specially qualified individuals for important executive and advisory positions in the Office of Military Government for Germany (U.S.). By his unreserved devotion to these tasks, always in a volunteer capacity and at a great sacrifice of time and effort, he made an effective contribution to the elimination of Germany as a threat to the peace and security of the world."

New in Education~

New Correspondence Course at University of Wisconsin

THE Extension Division of the University of Wisconsin is announcing a new course, taught by the correspondence-study method, entitled "Stress Analysis of Rigid Building Frames, Slope Deflection Method," for engineers and designers. After developing the general slope deflection theory, the course makes a practical application of the theory in the stress analysis of rigid building frames as constructed of steel and of reinforced concrete and subjected to live and dead vertical loadings and to horizontal loadings from wind and earthquakes.

The course, in 24 assignments, is based on a textbook and supplementary material. A prerequisite is a good working knowledge of engineering mechanics (statics), strength of materials, and essentials of structural theory. Enrolment is open to applicants in any state or country. The Civil and Structural Engineering Department, University Extension Division, at Madison, Wis., will provide additional information.

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Davis Undergraduate Welding Award

TO STIMULATE undergraduate interest in welding, funds have been donated by A. F. Davis, of the Lincoln Electric Company, for the A. F. Davis Undergraduate Welding Award, which will consist of four cash prizes totaling $700, to be presented annually to authors and publications for the best and second best articles on welding published in undergraduate magazines or papers during the preceding year.

Any undergraduate of a college, university, or institute of technology in the United States or Canada is eligible, but the paper must be published in an undergraduate publication. Judges selected by the Educational Committee of the American Welding Society will select the winning paper in July of each year, on the basis of originality of the paper and thoroughness with which the subject is covered.

The awards will be as follows: $200 each to the author of the best paper and

to the publication in which it appears, and $150 each to the author and the publication for the second-best paper. Presentation of the first A. F. Davis Undergraduate Welding Awards for papers published between now and July 1, 1946, will be made at the next annual meeting in October 1946. For further details address the National Publicity Committee, American Welding Society, 33 West 39th Street, New York 18, N.Y.

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Fluid Mechanics Fellowship at University of Minnesota

UNDER the sponsorship of the Standard Oil Company, a fluid mechanics fellowship has been established in the St. Anthony Falls Hydraulic Laboratory of the University of Minnesota. The monetary value is $1,500 per academic year, and the fellowship may be extended to two years if warranted by the recipient's progress and the time required to complete his research.

The recipient will receive in cash over a nine-month period an honorarium of $1,000. The remaining $500 will be used for tuition and fees incidental to registration in the Graduate School of the University, and for special apparatus required. The fellow will be a full-time graduate student, and his work will be personally supervised by the Director of the St. Anthony Falls Hydraulic Laboratory. The subject of his thesis is to be in the general field of fluid mechanics, and may be selected by him in consultation with the director of the laboratory, to the general satisfaction of the Standard Oil Company.

Applicants should have a basic training in fluid mechanics and qualify for entry into the Graduate School of the University of Minnesota. Application forms may be obtained from the Director, St. Anthony Falls Hydraulic Laboratory, University of Minnesota, Minneapolis, Minn. Although the closing date for applications has not been definitely set, it is recommended that application be made at an early date.

NEWS OF ENGINEERS

Personal Items About Society Members

BENJAMIN S. THAYER, construction manager for United Engineers and Constructors, Inc., of Philadelphia, Pa., has been elected vice-president of the organization.

ROBERT H. DODDS was recently promoted from the rank of lieutenant in the Civil Engineer Corps of the U.S. Naval Reserve to that of lieutenant commander. He is on duty in the historical division of the Bureau of Yards and Docks in Washington, D.C.

LEONID HASSILEV, formerly executive secretary of the French Mission of Public Works in Washington, D.C., has been appointed chief of the Division of Public Works of the French Supply Council in Canada, with offices in the Dominion Square Building, Montreal. In this new capacity he will be in charge of procuring floating equipment, such as barges, tugs, and dredges, for the reconstruction of French harbors and inland waterways.

ROBERT M. LAFOLLETTE, who was recently discharged from the Corps of Engineers, U.S. Army, in which he held the rank of lieutenant colonel, has returned to his engineering practice. He is associated with CHARLES A. HASKINS in Kansas City, Mo.

BORIS W. BOGUSLAVSKY has been appointed professor and head of the department of civil engineering at the University of Akron. He was previously professor of structural engineering there.

C. CLAYTON SINGLETON is now regional structural engineer for the Philadelphia office of the Portland Cement Association, with headquarters at 1528 Walnut Street. Until lately he was regional structural engineer for the organization in Chicago.

JOSEPH A. FOX has resumed his position with the Detroit (Mich.) Department of Public Works after serving with the Corps of Engineers, U.S. Army, with the rank of captain. His most recent assignment was with the European Theater of Operations in Paris, where his work included the establishment and management of army engineering packing standards and, later, the redeployment planning of engineering equipment and supplies.

PHILIP B. STREANDER announces that he is now operating a consulting practice under the name of Philip B. Streander and Affiliates. His work in the New England States will be handled through the office of Cleverdon, Varney and Pike, 120 Tremont Street, Boston 8, Mass., and that in the Middle Atlantic States by Damon and Foster, of Sharon Hill, Pa. He will divide his time between the two places. During the war Mr. Streander was in charge of water supplies and general sanitation work on several defense projects for the Stone and Webster Engineering Corporation, of Boston.

JOHN D. WATSON has, with James E. Hart, established a consulting practice in Greensboro, N.C. The new firm, which will have the name of Watson and Hart, will specialize in industrial and municipal improvements. Mr. Watson was previously with the J. A. Jones Construction Company on the Oak Ridge (Tenn.) project.

RICHARD F. LOVEJOY has accepted the position of senior engineer for Alameda, Calif., following service as a lieutenant in the Civil Engineer Corps of the U.S. Naval Reserve.

THOMAS S. BURNS has been transferred from the U.S. Engineer Office in Providence, R.I., where he was chief of the engineering division, to a similar position in the U.S. Engineer Office at Syracuse, N.Y.

SANDOR MARK, lieutenant, Corps of Engineers, U.S. Army, has returned to the United States after two and a half years of service in New Guinea, Leyte, and Luzon. As soon as he is placed on inactive duty he will engage in city planning and house building, serving as field engineer for Jacob Mark and Sons, New York 17, N.Y.

MERRILL C. LORENZ and H. M. Metcalf have established the consulting firm of Lorenz and Metcalf, with headquarters in Davenport, Iowa. Mr. Lorenz is a specialist in foundation investigations, and the new firm will specialize in foundation problems.

RICHARD SALMON, formerly senior construction engineer in the Office of the Coordinator of Inter-American Affairs, Lima, Peru, has accepted a position with Barr and Lane, Inc., of New York City. He will be project engineer for the firm on construction work at Ithaca, N.Y.

CHARLES E. MAHER, lieutenant, Civil Engineer Corps, U.S. Naval Reserve, was recently discharged from the Navy after two and a half years with the 50th Seabees on advance base construction on Midway. He has returned to the U.S. Engineer Office at Kansas City, Mo., for assignment with the Construction Division.

GAIL A. HATHAWAY, Director of the Society, has been appointed special assistant to the Chief of Engineers.

GEORGE K. CARNES, captain, Corps of Engineers, U.S. Army, has returned from duty in the Southwest Pacific and is now an instructor in the engineering department at Fort Belvoir, Va.

ROBERT E. MCGOWAN, engineer for the U.S. Bureau of Reclamation, was recently transferred from the Columbia Basin Project at Coulee Dam, Wash., to Boise, Idaho.

HOMER R. MARSON, until lately assessor for the city of Detroit, Mich., has been appointed city controller.

ARTHUR B. ONDERDONK, who has just reverted to inactive status in the Civil Engineer Corps of the U.S. Naval Reserve, recently received letters from the Navy Department on three successive days informing him of three honors that have been awarded him. These are the Commendation Ribbon for his unit's performance at Iwo Jima (Underwater Demolition Team 14); the Bronze Star Medal and citation; and the Gold Star (in lieu of a second Silver Star). Lieutenant Onderdonk's home is in East Hartford, Conn.

CHARLES M. NOBLE, commander, Civil Engineer Corps, U.S. Naval Reserve, was recently appointed New Jersey State Highway Engineer. Commander Noble has been serving as deputy director of the Advance Base Department, Bureau of Yards and Docks, Washington, D.C. Prior to that he had had assignments with Seabee units in Alaska and China.

THEODORE T. MCCROSKY, former director of the New York Planning Commission, has been appointed executive director of the Greater Boston Development Committee. He was recently re-

leased from the U.S. Naval Reserve, in which he held the rank of commander.

EDWARD M. BEARDSLEE is now city manager of Fernandina, Fla. He previously held a similar position at DeLand, Fla.

THOMAS F. BOWE and JOHN G. ALBERTSON have established an engineering practice at 110 William Street, New York City, the firm name to be Bowe, Albertson and Associates. Until recently both were in the Civil Engineer Corps of the U.S. Naval Reserve, in which Mr. Bowe held the rank of lieutenant commander and Mr. Albertson that of lieutenant.

NEAL D. SMITH is now city engineer of San Diego, Calif. He was previously city manager of Ontario, Calif.

ROY B. WILLIAMS, for many years on the staff of the U.S. Bureau of Reclamation, has been assigned to new duties as assistant supervising engineer for the Columbia Basin Project, with headquarters at Coulee Dam, Wash.

CHARLES E. PUTNAM and his son, E. G. Putnam, have established an engineering practice at Bellingham, Wash. Until lately Mr. Putnam was with Seattle City Light, Ross Dam Division.

WALTER H. JOLLIE, who returned recently from overseas service in the Corps of Engineers, U.S. Army, has resumed his connection in the sanitary engineering division of the Illinois State Department of Public Health at Springfield, Ill. He held the rank of captain.

JOSEPH L. BURKHOLDER is now engineer-manager of the San Diego County (Calif.) Water Authority.

FRANK C. DUGAN, until lately a major in the Corps of Engineers, U.S. Army, has returned to his former position as chief engineer of the Kentucky State Health Department.

JOHN F. LABOON, colonel, Corps of Engineers, U.S. Army, has resumed his former position as director of the Allegheny County Department of Works in Pittsburgh, Pa., after three years in the service—two of them spent overseas.

ROBY B. BEVAN has severed his connection as structural engineer for the Tennessee Valley Authority at Knoxville, Tenn., in order to accept the position of head mechanical and structural engineer for the Ambursen Engineering Corporation at Houston, Tex.

SUMNER C. WILLIS is now superintendent of construction for the H. K. Ferguson Company, industrial engineers and builders of Cleveland, Ohio. Until lately he was production manager for the National Company, of Malden, Mass.

G. W. PARKHILL has, with MARLIN P. SMITH, JR., and S. C. COOPER, formed an engineering company, to be known as Parkhill, Smith, and Cooper, with offices in the Sanford Building, Lubbock, Tex. Mr. Parkhill was formerly an instructor at Texas Technological College; Mr. Smith, former city manager of Lubbock; and Mr. Cooper, former city engineer of Big Spring.

DAVID MCCOACH, JR., major general, Corps of Engineers, U.S. Army, announces that he will retire from the Army after 39 years of service and become vice-president of the Charles H. Tompkins Company, construction engineers of Washington, D.C. Some of the more important assignments held by General McCoach during his long service in the Corps of Engineers are District Engineer for New York and Detroit; Engineer Commissioner of the District of Columbia; Assistant Chief of Engineers; Commanding General of the Ninth and, later, the Sixth Service Command; and chief engineer of the Mediterranean Theater of Operations during the recent war.

MAJ. GEN. DAVID MCCOACH, JR.

CHARLES H. FOGG, who is an associate engineer in the U.S. Engineer Office, has been transferred from Little Rock, Ark., to the Southwest Division Office in Dallas, Tex.

HOLTON COOK has left for Liberia, where he will represent the Fargo Engineering Company, of Jackson, Mich., in the investigation of hydroelectric possibilities on some of the rivers of that country. He will also have general supervision of the construction of the final section of Lower Falls Dam on the Farmington River in Liberia, owned by the Firestone Plantations Company.

JAMES W. STEVENS, formerly designing engineer for the Texas State Highway Department at Austin, has accepted the position of building inspector for the city of Amarillo, Tex.

WILLIAM S. LALONDE, JR., who recently rejoined the faculty of Newark College of Engineering after four and a half years' service in the Navy, has been named chairman of the civil engineering department. Professor La Londe held the rank of commander in the U.S. Naval Reserve at the time of his discharge.

PHILIP SPORN, executive vice-president of the American Gas and Electric Service Corporation, New York, N.Y., is the winner of the Edison Medal for 1945 "For his contributions to the art of economical and dependable power generation and transmission." The medal, which was founded by associates and friends of Thomas A. Edison, is given annually for "meritorious achievement in electrical science, electrical engineering, or the electrical arts" by a committee composed of 24 members of the American Institute of Electrical Engineers. The medal was presented to Mr. Sporn on January 23 at the winter convention of the A.I.E.E.

ANDREW BRODSKY, formerly on the faculty of the College of the City of New York, was recently discharged from the Army in Berlin, Germany, to accept employment with the Treasury Department. Mr. Brodsky has been assigned to the Finance Division of the Office of Military Government for Germany as investigator and interpreter, acting as Russian interpreter at the finance directorate meetings of the Allied Control Authority and as technical adviser.

FRANK A. BANKS, until lately regional director for the U.S. Bureau of Reclamation, will now serve the Bureau as supervising engineer for its million-acre Columbia Basin irrigation project. Another member of the Society—ROBERT J. NEWELL, previously associate regional director—has been appointed regional director for the Bureau in the Pacific Northwest, in charge of development activities in four states.

ROBERT S. MAYO announces that he has returned to Lancaster, Pa., where he will resume the design and manufacture of steel forms and tunnel equipment, after three years in the Marine Corps. Major Mayo was executive officer of the Engineer Battalion of the 6th Marine Division and took part in the entire Okinawa operation and in the occupation of Tsingtao, China.

HUGH M. ARNOLD, colonel, Corps of Engineers, U.S. Army, is a recent recipient of the Legion of Merit for outstanding services from July 1944 to October 1945. "As deputy engineer for the island of Saipan," during this period, "Colonel Arnold personally conceived and supervised the joint Army-Navy construction organization for the development of this important base."

WILLIAM J. HEISER was recently elected vice-president of Lockwood Greene Engineers, Inc., of New York, N.Y. Mr. Heiser has been with the organization for twenty years—in the capacity of chief engineer for the past year.

GEORGE M. STIERS is now connected with the Amis Construction Company, general contractors of Oklahoma City, Okla. He has just been released from the Civil Engineer Corps of the U.S. Naval Reserve, in which he held the rank of lieutenant.

GEORGE E. SPARGO has been appointed deputy mayor of New York by Mayor William O'Dwyer. Mr. Spargo will still hold the position of general manager of the New York City Tunnel Authority and the Triborough Bridge Authority, as the new post carries no salary.

RICHARD H. TATLOW, III, colonel, General Staff Corps, U.S. Army, has been awarded the Legion of Merit for his ser-

vices as a member of the staff of the Production Division, Army Service Forces, from October 1942 to May 1945. The citation reads that, in this capacity, he "was eminently successful in his management of the Army's industrial facilities program."

WILSON V. BINGER has left for Caracas, Venezuela, where he will be soils engineer for Parsons, Brinckerhoff, Hogan, and MacDonald. His address will be c/o Consulting Engineers, C.A., Apartado 168, Caracas, Venezuela. Until lately Mr. Binger was a lieutenant in the U.S. Army overseas.

LEO F. CROWLEY, lieutenant commander, Civil Engineer Corps, U.S. Naval Reserve, has returned to his former position in the Detroit (Mich.) City Engineer's Office after serving with the 81st Naval Construction Battalion in England and France for sixteen months. For distinguished conduct during an enemy air raid in southern England, he received the Navy and Marine Corps Medal.

LESLIE G. SUMNER is now director of engineering and construction for the Connecticut State Highway Department. He was previously engineer of bridges and structures.

HENRY E. RIEXINGER has retired as chief engineer for the International Railway Company, Buffalo, N.Y., after thirty-five years of service.

HOMER A. HUNTER, formerly assistant city manager of Dallas, Tex., has been appointed city manager of Lubbock, Tex.

GORDON R. YOUNG, brigadier general, Corps of Engineers, U.S. Army, has been awarded the Distinguished Service Medal for his recently completed services as commandant of the Engineer School at Fort Belvoir, Va. General Young's present assignment is that of engineer commissioner of the District of Columbia.

DECEASED

ROBERT MORRISON ANDREW (Assoc. M. '37) engineer for Shumaker Brothers, of Indianapolis, Ind., died recently at the age of 37. From 1930 to 1931 and again from 1933 to 1943 Mr. Andrew was with the Indiana State Highway Commission—for several years in the capacity of project engineer. He became connected with Shumaker Brothers in 1944.

WILLIAM MELVIN BAILEY (M. '08) president and treasurer of the William M. Bailey Company, Boston, Mass., died at his home in Malden, Mass., on December 1, 1945. Mr. Bailey, who was 76, spent his early career on sewerage work for the cities of Newton, Malden, and Concord, Mass., and as assistant engineer for the Boston Transit Commission. From 1900 to 1912 he was chief engineer for the Eastern Expanded Metal Company, of Boston, and since the latter date he had been president of the engineering and contracting company bearing his name.

JACOB HERBST BRILLHART (M. '12) president of the Fort Worth Structural Steel Company, Fort Worth, Tex., died at his home in that city on December 17, 1945. He was 65. From 1905 to 1912 Mr. Brillhart was with the Guerber Engineering Company of Bethlehem, Pa.;

THE LATE J. H. BRILLHART
Former Director of the Society

from 1912 to 1921, successively chief engineer and consulting engineeer for the Mosher Manufacturing Company, of Dallas, Tex.; and from 1922 to 1927, vice-president and manager of the steel and tank departments of the Fort Worth Steel and Machinery Company. Since 1928 he had been president and general manager of the Fort Worth Structural Steel Company. Long active in the Society, Mr. Brillhart served a term as Director from 1927 to 1929. He had also been president of the Texas Section.

ASHER ATKINSON (M. '18) consultant to the water department, New Brunswick, N.J., died at his home there on January 3, 1946. Mr. Atkinson, who was 77, had spent most of his career as city engineer of New Brunswick, having served in that capacity for over forty years. His early experience included work with the East Orange Water Works and a period as engineer in charge of the New York office of the Corrugated Bar Company.

CLEVELAND BEACH COE (M. '42) lieutenant colonel, Corps of Engineers, U.S. Army, died at Camp Lee, Va., on November 29, 1945. Colonel Coe, who was 52, had maintained a consulting practice in Johnson City, Tenn., at various periods in his life and had also been commissioner of streets and city engineer there. In 1934 he became associate highway engineer for the Tennesseé Valley Authority, remaining in that capacity until 1940 when he went into the Army. During the first World War he served overseas, and later was a lieutenant colonel in the Corps of Engineers, Reserve.

WALDO SCARLETT COULTER (M. '22) retired engineer of Brooklyn, N.Y., died on November 20, 1945, at the age of 68. Mr. Coulter spent his early career in public works construction, having been with the Massachusetts Metropolitan Water Works, the U.S. Bureau of Reclamation, the New York State Engineer and Surveyor Department, and the New York City Public Service Commission. From 1916 to 1934 he was in private practice in New York, specializing in water works and sewerage construction. And later he was senior engineer for the Federal Works Agency in Washington, D.C.

HERBERT DEAKYNE (M. '26) brigadier general, Corps of Engineers, U.S. Army (retired), died on May 28, 1945, at the age of 77. From 1890 until his retirement in 1931 General Deakyne was in the Corps of Engineers, in charge of fortification work and river and harbor improvement in various parts of the United States and the Philippine Islands. During the first World War he served overseas with the A.E.F. as brigadier general and chief engineer of the 2d Army. From 1926 to 1930 he was Assistant Chief of Engineers, and from 1926 to 1931 he was senior member of the Board of Engineers for Rivers and Harbors.

NORBERT ARTHUR DIERSEN (Jun. '44) ensign, Civil Engineer Corps, U.S. Naval Reserve, died in Brooklyn Naval Hospital, Brooklyn, N.Y., on April 9, 1945. Mr. Diersen, who was 23, received the degree of B.C.E. from the University of Minnesota in 1943. His home was in Caledonia, Minn.

GEORGE FREDERICK ECKHARD (M. '37) dean of the college of engineering of the University of Vermont, died at his home in Burlington, Vt., on December 28, 1945. His age was 67. Dean Eckhard was professor of civil engineering at the New Mexico School of Mines from 1907 to 1909; at James Millikin University from 1909 to 1912; and at Pennsylvania State College from 1912 to 1915. In the latter year he joined the faculty of the University of Vermont in the capacity of professor of civil engineering, and he had been dean of the college of engineering since 1932. Under his direction the facilities of the engineering college were considerably expanded. Dean Eckhard was active in civic affairs, having served for twenty years as street commissioner of the city of Burlington. He was also instrumental in sponsoring the law for the licensing of professional engineers in Vermont.

ROBERT WIRT ECKMAN (Jun. '41) of Wilmington, Del., was killed in action over a year ago, although word of his death did not reach the Society until now. Following his graduation from the University of Delaware in 1941, Mr. Eckman became a draftsman for E. I. du Pont de Nemours and Company. He was 25.

FRANCIS VIRGIL FRAZIER (Jun. '36) tail surface supervisor for the Hughes Aircraft Company, Culver City, Calif., died recently. Mr. Frazier, who was 32, graduated from the California Institute of Technology in 1936. He then became junior engineer for the U.S. Bureau of Reclamation at Denver, Colo., and since 1941 had been with the Hughes Aircraft Company.

RALPH WELLES GAYLORD (Assoc. M. '19) of Corpus Christi, Tex., died at his

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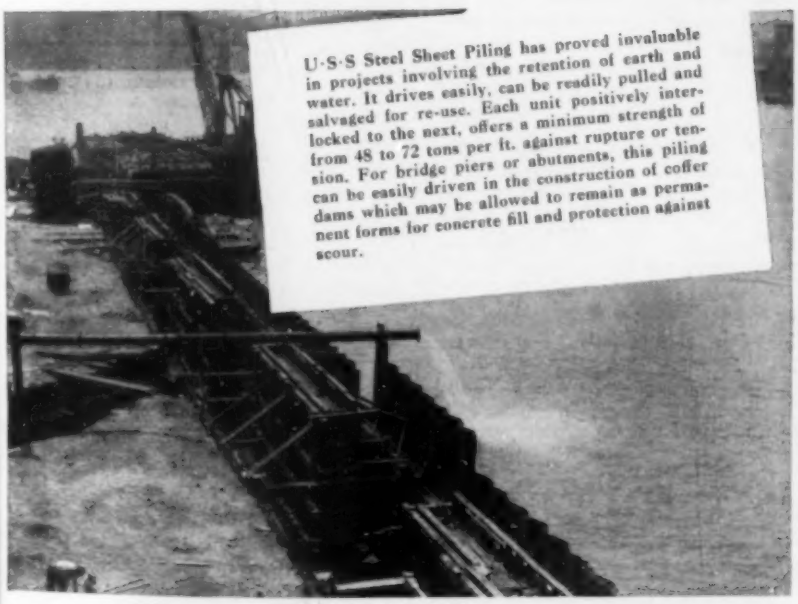

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home there on September 7, 1945, at the age of 55. Mr. Gaylord spent his early career in Hawaii, where he was, successively, asssistant engineer for the San Francisco Bridge Company on the construction of the Pearl Harbor drydock, and assistant superintendent for the Hawaiian Dredging Company. Later he was in charge of the drafting room and field work for the San Francisco Bridge Company at Pearl Harbor and of the construction of a concrete wharf for the U.S. Army there. At one time, also, he was with the Raymond Concrete Pile Company in Detroit, Mich.

CHAUNCEY MARSH GOODRICH (M. '30) consulting engineer for the Canadian Bridge Company, Ltd., Walkerville, Ontario, Canada, died at his home in Windsor, Ontario, on December 9, 1945. His age was 70. He had been associated with the Canadian Bridge Company since 1901 except for a period during the first World War when he served in the Corps of Engineers, U.S. Army. He held the position of chief engineer from 1926 to 1940, and since the latter date had acted as consulting engineer for the company.

PUSEY JONES (M. 31) consulting engineer of Cincinnati, Ohio, died on November 22, 1945, at the age of 65. For some years Mr. Jones was bridge engineer for the Boston and Maine Railroad, with headquarters in Boston, Mass. He then (1928) went to Cincinnati as structural engineer on the planning and construction of the Cincinnati Union Terminal. Since 1934 he had maintained a consulting practice in Cincinnati—first as a member of the firm of Stowitts and Jones and, since 1940, of the firm of Larson, Jones and White.

WILLIAM KAUFHOLZ (Assoc. M. '32) structural squad leader for the Maryland plant of the Bethlehem Steel Company at Sparrows Point, Md., died on August 21, 1945. Mr. Kaufholz, who was 45, had been connected with the Bethlehem Steel Company since 1925. Earlier he was with the Baltimore and Ohio Railroad and the Western Maryland Railway.

JAMES BUTTON CLYDE LOCKWOOD (M. '01) engineer for the Puget Sound Bridge and Dredging Company, of Seattle, Wash., died on December 2, 1945. His age was 82. From 1889 to 1898 Mr. Lockwood was manager of the Seattle office of the San Francisco Bridge Company. He then became president and chief engineer of the Puget Sound Dredging Company, resigning later to establish a consulting practice in Portland, Ore. More recently he maintained consulting offices in Seattle, and was treasurer of Alaska Sunset Mines. During the war he became connected again with the Puget Sound Bridge and Dredging Company.

LEONARD LUNDGREN (M. '18) engineer and educator of San Francisco, Calif., was drowned at Ocean Beach, Calif., on June 16, 1945, after being stricken suddenly with a heart attack. Mr. Lundgren, who was 61, had been on the staff of the San Francisco public schools since 1923. His earlier experience had included work as project engineer for the Philippine government from 1908 to 1912, and as district engineer for the U.S. Forest Service from 1913 to 1917. In the latter year he became a captain in the Corps of Engineers, U.S. Army, serving in that capacity until 1923.

JOSEPH NATHANIEL MAHONEY (M. '18) consulting engineer and inventor, of Brooklyn, N.Y., died at his home in that city on January 1, 1946, at the age of 67. Mr. Mahoney had held engineering positions with the Westinghouse Electric and Manufacturing Company in Pittsburgh; the Westinghouse Air Brake Company, of Wilmerding, Pa.; the Sperry Gyroscope Company, of Brooklyn; and the Pacific Electric Manufacturing Corporation, of San Francisco. In 1929 and 1930 he was president of the Herbert E. Bucklen Corporation in Elkhart, Ind., and the Perkins Corporation, of South Bend, Ind., and since 1933 he had been consultant to the work manager of the Wright Aeronautical Corporation, of Paterson, N.J. An active contributor to scientific and professional journals, Mr. Mahoney obtained many patents from the United States and foreign countries for developments and refinements on air brakes.

CHARLES M. NEELD (M. '08) of Pittsburgh, Pa., died in Annapolis, Md., on December 23, 1945, at the age of 70. Mr. Neeld was with the Fort Pitt Bridge Works from 1896 to 1898, and the Columbia Bridge Company from 1898 to 1900. He then held various positions with the McClintic-Marshall Construction Company until 1911, including six years as general manager of the Pittsburgh plant. In the latter year he organized and became president of his own firm, the C. M. Neeld Construction Company, of Pittsburgh. Mr. Neeld designed and constructed many bridges and other structures, and was the inventor of a new type of light-weight bridge floor.

IAN MACKENZIE SUTHERLAND (M. '25) civil engineer of Melbourne, Australia, died on April 17, 1945, at the age of 62. Born and educated in Australia, Mr. Sutherland had been with the Melbourne and Metropolitan Board of Works since 1911 and at the time of his death was senior designing engineer. Earlier in his career he had been with the Victorian Railway Department and the State Rivers and Water Supply Commission of Victoria.

WALTER AMBROSE SWALLOW (M. '20) of Albany, Ga., died in October 1945. Mr. Swallow, who was 65, spent his early career (1901 to 1913) in railroad work. During the first World War he served in the Construction Division of the Quartermaster Corps, attaining the rank of major, and from 1920 to 1922 he was a captain in the Regular Army. After two years in general engineering practice in Washington, D.C., Mr. Swallow then became a civilian engineer in the Office of the Chief of Building Branch of the War Department, remaining until 1933. Later he was supervising engineer for the U.S. Coast and Geodetic Survey at Columbia, S.C., and Coral Gables, Fla.

FORREST MILTON TOWL (M. '96) retired chairman of the board of the Southern Pipe Line Company and other pipeline firms, died at his home in Brooklyn, N.Y., on January 3, 1946. His age was 83. Mr. Towl started his career with the National Transit Company, and in 1902 transferred to the Pacific Coast Oil Company. From 1911 to 1932 he was president of various subsidiaries of the Standard Oil Company, and since 1934 had been engaged in research work at Cornell University on the relative viscosity of oil and related subjects. During the first World War Mr. Towl designed and supervised the construction of a vital stretch of 8-in. pipe line across Scotland, which made it possible for Allied naval vessels in the North Sea to refuel without being dependent on tankers.

Changes in Membership Grades

Additions, Transfers, Reinstatements, and Resignations

From December 10, 1945, to January 9, 1946, Inclusive

ADDITIONS TO MEMBERSHIP

ABRAMOVITZ, CHARLES (Jun. '45), Associate Engr., Burgess and Niple, 568 East Broad St. (Res., 290 East Lane Ave.), Columbus, Ohio.

ANDERSON, STUART HETZELL (M., '45), Examining Engr., Bureau of Community Facilities, Federal Works Agency, 1729 New York Ave., Room 410, Washington 25, D.C.

ARNTZEN, DONALD WAYNE (Jun. '45), With U.S.N.R.; 7347 Dibble Ave., Seattle 7, Wash.

BAUM, JOHN WILLIAM (Assoc. M. '45), Engr., U.S. Bureau of Reclamation, Custom House (Res., 3618 Garfield St.), Denver, Colo.

BEATON, JOHN LEO (Assoc. M. '45), Senior Eng. Examiner, State Personnel Board, 1015 L St. (Res., 2762 Marshall Way), Sacramento 17, Calif.

BERGHLY, WILLIAM MILTON (M. '45), Civ. Engr., Ralph L. Woolpert Co., Cons. Engrs., 132 North Main St. (Res., 20 Marathon Ave.), Dayton 5, Ohio.

BONET Y GUILAYN, JOSE (M. '45), Ingeniero de Caminos Canales y Puertos, Pardo, Proctor, Freeman & Muesser, Ap. Correos 614 (Res., Edificio Altamira, dep 4 San Bernardino), Caracas, Venezuela.

BRIGGS, FRED MELVELLE (Jun. '45), Ensign, CEC, U.S.N.; Kirley, S.Dak.

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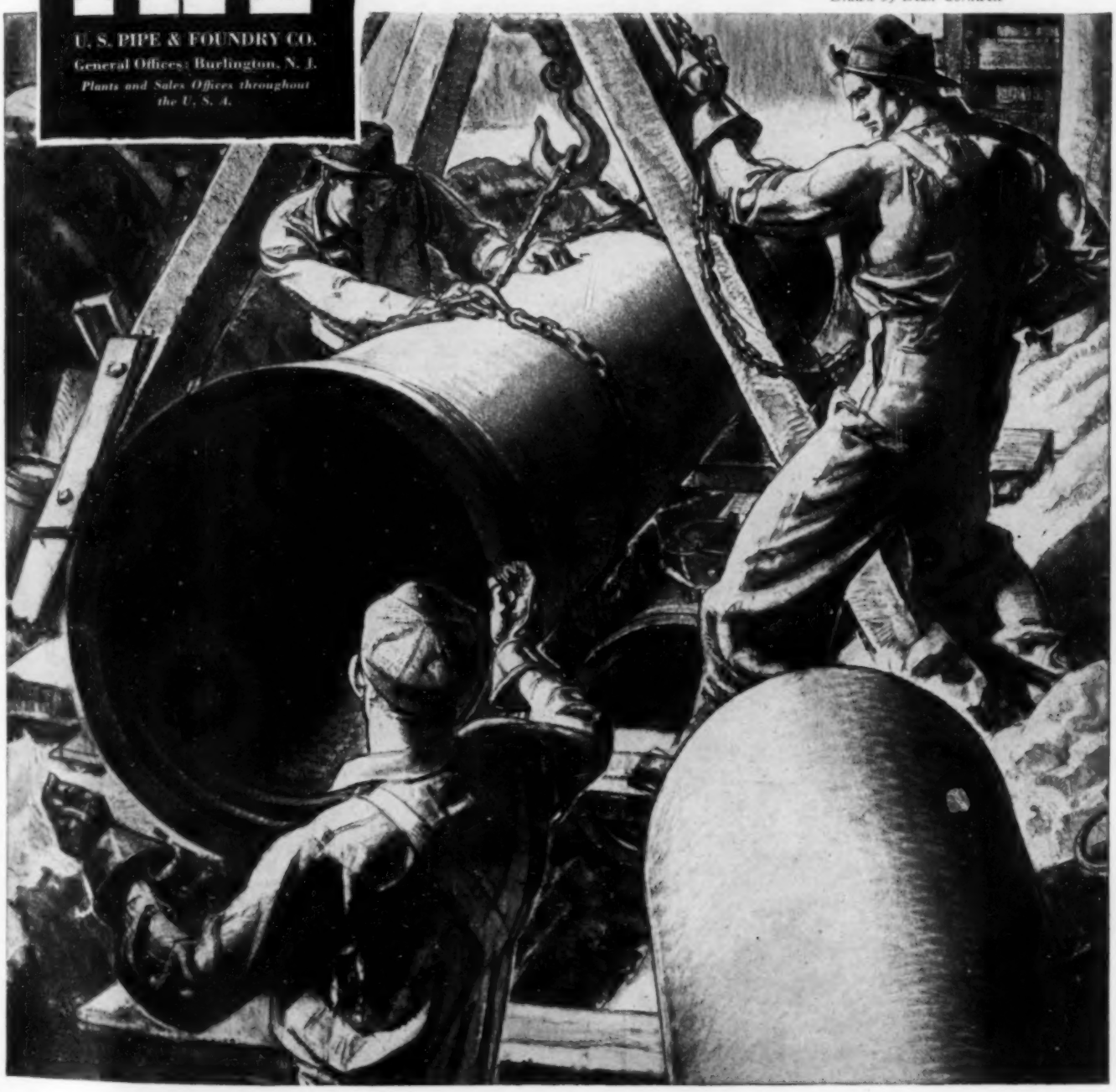

BRONSON, HARRY SCHURMAN (M. '45), County Engr., Ramsey County, 367 Court House (Res., 1693 Berkeley Ave.), St. Paul, Minn.

CHUTE, RALPH MACDONALD (Assoc. M. '45), San. Engr., Hillsdale County Health Dept., 39 North St., Hillsdale, Mich.

CRUM, WALTER EDWIN (Jun. '45), 17 Maple Pl., Minneapolis 1, Minn.

DELANEY, JAMES FRANCIS, JR. (Jun. '45), Ensign, U.S.N.R.; 54 Parklawn Rd., West Roxbury, Mass.

DELANEY, RALPH WARD (Assoc. M. '45), Civ. Engr., Geo. G. Toler, Cons. Engr., Box 1137, Ada, Okla.

ECHOLS, MARION PATTON, JR. (Jun. '45), Student Engr., York Corp. (Res., Room 309, Y.M.C.A.), York, Pa.

FERTIG, MARCEL MAURICE MARSHALL (Assoc. M. '45), Structural Engr., Koppers Co., Inc., Koppers Bldg. (Res., 712 Princeton Blvd.), Pittsburgh 21, Pa.

FINK, JUDAH SOLOMON (Assoc. M. '45), Engr., Robert & Co., 114 Marietta St., North West, Atlanta 3, Ga.

FREEZE, WILLIAM ROBERT, JR. (Jun. '45), Ensign, CEC, U.S.N.R.; 700 Kennedy St., Charlotte 2, N.C.

FRIEDRICHS, ROY RUDOLPH (Jun. '45), Insp. of Constr.-Hydro., Pacific Gas & Elec. Co., 245 Market St. (Res., 19 Dartmouth St.), San Francisco 24, Calif.

GALLAHER, GLEN WILBUR (Jun. '45), Ensign CEC, U.S.N.R.; 572 Thirty-seventh St., San Pedro, Calif.

GARDNER, JOHN LAWRENCE (Jun. '45), Ensign, U.S.N.R.; 7 Argyle Road, Arlington 74, Mass.

GAUGHAN, JOHN HUGH (Assoc. M. '45), Engr. (2), Tennessee Eastman Corp. (Res., 741 Forest St.), Kingsport, Tenn.

GEBHART, LLOYD REED (Jun. '45), Sergeant, U.S. Army; Culver, Kans.

GOLDSMITH, MARVIN LAWRENCE (Jun. '45), Structural Design Draftsman, F. H. McGraw Co., 51 East 42d St., New York (Res., 57 Bay 23d St., Brooklyn 14), N.Y.

GRANT, MORTIMER LESLIE (Jun. '45), Ensign, CEC, U.S.N.R., Public Works, Navy 145, Care, Fleet Post Office, San Francisco, Calif.

HALL, GENE WILLIAM (M. '45) (Parsons, Brinckerhoff, Hogan & Macdonald), 142 Maiden Lane, New York 5, N.Y.

HALPERIN, DON AKIBA (Jun. '45), Engr., P-1, Navy Dept., Bureau of Yards and Docks, Washington, D.C. (Res., 4310 Knox Rd., College Park, Md.)

HEINEMAN, PAUL LOWE (Jun. '45), Ensign, CEC, U.S.N.R.; 4154 Chicago St., Omaha 3, Nebr.

HOMER, LEO KING (Assoc. M. '45), Associate Engr., U.S. Bureau of Reclamation, 1003 California Fruit Bldg., Sacramento, Calif.

HORN, WILLIAM GEORGE (Jun. '45), Apprentice Seaman, U.S.N.R.; 535 West 31st St., Chicago, Ill.

HOTARD, ALBERT ETIENNE (Jun. '45), Senior Instrumentman, L. & N. R.R. Co., 908 West Broadway, Louisville, Ky. (Res., 221 Pelican Ave., New Orleans, La.)

ISAACS, JOHN DOVE (Jun. '45), 1708 E St., Eureka, Calif.

JONES, NORMAN BLAIR (Jun. '45), Ensign, CEC, U.S.N.R.; 48 North Yale Ave., Villa Park, Ill.

KARNOWSKI, LAWRENCE STEPHEN (Jun. '45), With Burns and McDonnell Eng. Co., 107 West Lindwood (Res., 105 East Pocahontas Lane), Kansas City 5, Mo.

LARSON, ROBERT FRANK (Jun. '45), Ensign, CEC, U.S.N., 124th Naval Constr. Battalion, Care, Fleet Post Office, San Francisco, Calif.

LEATHERWOOD, LEE EDMOND (Jun. '45), Structural Computer, Eastman Kodak Co.; 1109 Seventh Ave., Dodge City, Kans.

LE ROUX CATER, EMILIO ANGELO (Jun. '45), Civ. Engr., Apartado 2054, Lima, Peru.

LEE, PING CHENG (M. '45), Senior Engr., Chinese Supply Comm., 1601 V St., N.W., Washington 9, D.C.

LEVINTON, ZUSSE (M. '45), Design Engr., Frederic R. Harris, Inc., 27 William St. (Res., 780 Grand Concourse), New York 51, N.Y.

LIPPINCOTT, HAROLD WARE (Assoc. M. '45), Office Engr., Stone & Webster Eng. Corp.; 3741 Bell St., Kansas City, Mo.

MCCARTNEY, EARL OLIVER (Jun. '45), Engr. in Chg., U.S. Bureau of Reclamation, Box 52, Box Elder, Mont.

MACKIN, BLAKE (Jun. '45), With U.S.N.; 1145 North 30th St., Billings, Mont.

MAGNESON, NORMAN JAMES (Jun. '45), Ensign, CEC, U.S.N.; 2145 Greenleaf St., Santa Ana, Calif.

MAISEL, EMANUEL NATHAN (Jun. '45), Jun. San. Engr., Chicago Pump Co., 2300 West Wolfram (Res., 4444 Drexel Blvd.), Chicago 15, Ill.

MICHEL, RAYMOND ALLEN (Jun. '45), Ensign, CEC, U.S.N.R., Public Works Office, Commandant, 10th Naval Dist., San Juan, Puerto Rico.

MILLEGAN, JOSEPH JAMES (Jun. '45), Stress Analyst, Douglas Aircraft Co., Santa Monica (Res., 955 North Sepulveda, Los Angeles 24), Calif.

MOLLENHAUER, WILLIAM SIEPKER (Jun. '45), Ensign, CEC, U.S.N.R.: 2426 Vermont St., Quincy, Ill.

MOORMAN, RICHARD JOSEPH (Jun. '45), Ensign, U.S.N.R.; 3410 Oakview Pl., Cincinnati 9, Ohio.

NELSON, GORDON VERNON (Assoc. M. '45), (Associated Engrs. of Kansas City), 8 East 9th St., Kansas City 6, Mo.

OSPOVAT, ALEXANDER MAIER (Jun. '45), Detailer, Draftsman, Strobel & Salzman, Cons. Engrs., 500 Fifth Ave. (Res., 230 West 97th St., Apt. 7D), New York 25, N.Y.

PADORR, ROBIN ALAN (Jun. '45), Asst. Field Engr., Dravo Corp., Box 1150, Portsmouth, Ohio.

PLUMB, CHARLES SEYMOUR (Assoc. M. '45), With J. A. Allen, Gen. Contr., Box 247 (Res., 222 Tuxedo Court), Stockton, Calif.

RISDON, FLOYD LESTER (Assoc. M. '45), Engr., U.S. Bureau of Reclamation, New Customs House, Denver, Colo.

ROOP, DANIEL MOREHEAD (Jun. '45), Ensign, CEC, U.S.N.R.; 16 Niles Lane, Winchester, Mass.

ROSENE, ROBERT WINDOM (Jun. '45), Ensign, CEC, U.S.N.R.; 5304 Madison, Lincoln, Nebr.

SIKORA, JOHN (Jun. '45), Private, U.S. Army; 12 Demond St., Springfield 7, Mass.

SMITH, JACK MORGAN (M. '45), Prof., Civ. Eng. Dept., Georgia School of Technology, Atlanta, Ga.

SOUTHWICK, RAYMOND CURTIS (Jun. '45), Ensign, U.S.N.R.; 29 Baxter Ave., Quincy, Mass.

SUSSMAN, WILLIAM (Jun. '45), Engr., Alex. Sussman, 1484 Shakespeare Ave. (Res., 1501 Undercliff Ave.), New York 53, N.Y.

TARNLEY, ERIC JOSEPH (Jun. '45), 55 Clinton Pl., New York 53, N.Y.

TEJADA-SAENZ, JOSÉ (Jun. '45), Civ. Engr., Hydr. Machinery, Empresa de Energia Electrica, Medellin, Colombia, S.A.

TILLMAN, DONALD CALVIN (Jun., '45), Ensign, CEC, U.S.N.R.; Naval Constr. Training Center, Camp Endicott (0–7), Davisville, R.I.

UNGERER, JOSEPH CARL (Jun. '45), Insp. of Ordnance Material, War Dept., New York Ordnance Dist., 80 Broadway (Res., 301 East 38th St.), New York 16, N.Y.

WANG, YI-FU (Assoc. M. '45), Engr., National Resources Comm., China, Care, Librarian, U.S. Bureau of Reclamation, Denver 2, Colo.

WHITESELL, ROBERT RANDALL (Jun. '45), Draftsman, Bridge Dept., B. & O. R.R. Co., Room 1303 B. & O. Bldg. (Res., 220-A Ridgewood Rd.), Baltimore 10, Md.

WHYTE, DAVID PRITCHARD (Jun. '45), Ensign, CEC, U.S.N.R.; 12 East Concord, Kansas City 2, Mo.

WILLIS, SHELBY KENNETH (Jun. '45), Ensign, CEC, U.S.N.R.; 6 Knoll Drive, Alton, Ill.

MEMBERSHIP TRANSFERS

BAKER, WILFRED WILKINSON (Assoc. M. '29; M. '45), Engr., Bureau of Reclamation, Tucumcari, N.Mex.

BARATTINI, PAUL ANTHONY (Jun. '34; Assoc. M. '45), Structural Designer, M. W. Kellogg Co., 225 Broadway (Res., 290 Sixth Ave.), New York 14, N.Y.

BEDENIK, JACOB JAMES (Jun. '41; Assoc. M. '45), 520 Merchandise Mart (Res., 1238 West Madison St.), Milwaukee 4, Wis.

BELL, FRANK FREDERICK (Assoc. M. '27; M. '45), Vice-Pres., Uvalde Constr. Co., Box 3027, Dallas, Tex.

BERG, ULRIK TORNOE (Assoc. M. '23; M. '45), Cons. Engr., 220 Broadway, New York (Res., 7200 Ridge Blvd., Brooklyn 9), N.Y.

BERNSTROM, CARL GUSTAV (Jun. '32; Assoc. M. '45), R. D. 1, Rensselaer, N.Y.

BRETZ, CHARLES ELMER (Assoc. M. '26; M. '45), Cons. Hydr. Engr., 1221 North Pennsylvania Ave., Oklahoma City, Okla.

BURR, GEORGE DANFORTH (Jun. '25; Assoc. M. '27; M. '45), Lt. Col., Coast Artillery Corps, U.S. Army; 144 Aptos Ave., San Francisco 12, Calif.

CAMERON, HARRY FRANK, JR. (Jun. '39; Assoc. M. '45), Lt. Col., Corps of Engrs., U.S. Army; Downieville, Calif.

COHEN, PAUL ARTHUR (Jun. '27; Assoc. M. '36; M. '45), Associate Engr., Bureau of Highways, Dept. of Public Works, 314 Municipal Bldg., Baltimore 2, Md.

COTTON, JAMES ARNOLD (Jun. '39; Assoc. M. '45), Engr. in Chg., Fort Worth Sub-office, U.S. Engr. Office, Box 672, Forth Worth, Tex.

DATE, RICHARD FOSTER (Jun. '41; Assoc. M. '45), (Date & Co.), Box 458, Cordova, Alaska.

EBERSOLE, GORDON KEITH (Jun. '38; Assoc. M. '45), 527 South Douglas, Pasco, Wash.

FARNEY, HAROLD SAMUEL (Jun. '34; Assoc. M. '45), Associate Engr., U.S. Engr. Office, Wright Field (Res., 9 Nightingale Pl.), Dayton 10, Ohio.

FIELDSTAD, NORMAN SIGUR (Jun. '36; Assoc. M. '45), (Fieldstad and Son, Gen. Contrs.), Opportunity, Wash.

GRIFFIN, DONALD FRANCIS (Jun. '34; Assoc. M. '45), Associate Utilities Regulation Engr., Dept. of Public Utilities and Transportation,

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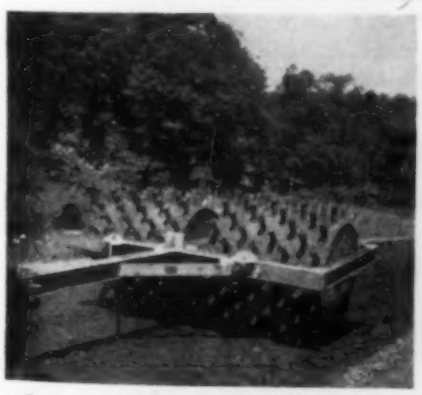

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GRUETER, PAUL CHARLES (Jun. '36; Assoc. M. '45), 1st Lt., Corps of Engrs., U.S. Army; 32 Melbourne Rd., East Milton, Mass.

KIRKPATRICK, GEORGE ALEXANDER (Jun. '33; Assoc. M. '45), Hydr. Engr., P-3, U.S. Geological Survey, 504 State Office Bldg., Salem, Ore.

LAINE, LEO LAURI (Jun. '37; Assoc. M. '45), Asst. Engr., Water Resources Branch, U.S. Geological Survey, Box 3095, Capitol Station, Oklahoma City 5, Okla.

LORENZ, MERRILL CHARLES (Jun. '30; Assoc. M. '41; M. '45), (Lorenz and Metcalf); Pres., The Gould Constr. Co., 517 South Birchwood Ave., Davenport, Iowa.

MENEFEE, RAYMOND HAROLD (Jun. '36; Assoc. M. '45), Designing and Constr. Engr., Chicago Bridge & Iron Co., 45 Prospect Ave., West, Cleveland (Res., 3542 Townley Rd., Shaker Heights 22), Ohio.

NEWMAN, FRANK HASTINGS, JR. (Assoc. M. '39; M. '45), Col., Corps of Engrs., U.S. Army; 2850 Orange St., Beaumont, Tex.

PADDOCK, FREDERICK WILLIAM (Jun. '38; Assoc. M. '45), Civ. Engr., U.S. Soil Conservation Service, Box 377, Dolores, Colo.

PANISH, CHARLES KING (Assoc. M. '39; M. '45), Lt. Col., Corps of Engrs., U.S. Army, Care, U.S. Engr. Office, 120 Wall St., New York 5, N.Y.

RODRIGUEZ, GUILLERMO (Jun. '38; Assoc. M. '45), Asst. Supt., Constructora Martinz, S.A., Box 1489, Panama City, Panama.

SAFFIR, HERBERT SEYMOUR (Jun. '41; Assoc. M. '45), Structural Designer, Hardesty and Hanover, 101 Park Ave., New York (Res., 149 Willow St., Brooklyn 2), N.Y.

STEELMAN, COURTLAND (Assoc. M. '43; M. '45), Field Project Mgr., E. I. du Pont de Nemours & Co., Eng. Dept., Nemours Bldg., Wilmington, Del.

SWANSON, VICTOR GEORGE (Jun. '36; Assoc. M. '45), Maj. Engrs., Australia; State Rivers and Water Supply Comm., Melbourne C2, Victoria, Australia.

TOTAL MEMBERSHIP AS OF JANUARY 9, 1946

Members	6,349
Associate Members	8,090
Corporate Members	14,439
Honorary Members	38
Juniors	6,559
Affiliates	78
Fellows	1
Total	21,115
(January 9, 1945	20,456)

THOMPSON, ROBERT BARKER (Jun. '35; Assoc. M. '45), Asst. Research Director, The Dorr Co., Inc., Westport, Conn.

WEBER, EUGENE WILLIAM (Jun. '39; Assoc. M. '45), Lt. Col., Corps of Engrs., U.S. Army, 8416 Woodcliff Court, Silver Spring, Md.

WILSON, ROBERT ANTHONY (Jun. '36; Assoc. M. '45), Asst. San. Engr. (Reserve), U.S. Public Health Service, 603 Planters Bank Bldg. (Res. 1106 West 43d St.), Richmond, Va.

WINBERG, GUS JACKSON (Jun. '42; Assoc. M. '45), Design Engr. and Estimator, Pollock-Stockton Shipbuilding Co. (Res., 457 East Arcade St.), Stockton 50, Calif.

WIXOM, CLINTON WOOD (Assoc. M. '30; M. '45), Designing Engr., Am. Bridge Co., 71 Broadway, New York 6, N.Y. (Res., 710 Carpenter Lane, Philadelphia 19, Pa.)

REINSTATEMENTS

COUTS, ROBERT JAMES, Jun., reinstated Jan. 1, 1946.

GREEY, ELMER BLOOMFIELD, Assoc. M., reinstated Jan. 1, 1946.

HIPWELL, HOWARD SCOTT, M., reinstated Jan. 1, 1946.

JOHNSON, DAVID RANDOLPH, Jun., reinstated Jan. 1, 1946.

LESH, HARRY WILLIAM, Assoc. M., reinstated Jan. 1, 1946.

MCNAMARA, STEPHEN JAMES, Assoc. M., reinstated June 1, 1945.

MONROE, ROY HAYDEN, Assoc. M., readmitted Dec. 19, 1945.

PRAWDZIK, THADDEUS BOLESLAUS, Jun., reinstated Jan. 1, 1946.

SPAYDE, KEITH CRAWFORD, Assoc. M., reinstated Jan. 1, 1946.

SMITH, WALTER GROVER, M., reinstated Jan. 1, 1946.

VAN DER VEEN, HERMAN M., reinstated Jan. 1, 1946.

VICKERS, PAUL AMOS, Assoc. M., reinstated Jan. 1, 1946.

RESIGNATIONS

ADAMS, LEWIS MILTON, M., resigned Dec. 31, 1945.

HOLTER, CHARLES ERSKINE, Jun., resigned Dec. 31, 1945.

IRWIN, FREDRICK BRUCE, Jun., resigned Jan. 2 1946.

KING, EDWARD, Jun., resigned Dec. 31, 1945.

NAGEL, WILLIAM BROCK, Jun., resigned Dec. 31 1945.

OSBORN, HUGH, Assoc. M., resigned Dec. 31, 1945.

PAGE, JOHN RUFFNER, Jun., resigned Dec. 31, 1945.

RANDALL, ROBERT HENRY, Jun., resigned Dec. 31, 1945.

SCHLEGEL, GLENN MARCUS, Assoc. M., resigned Dec. 31, 1945.

SCORALICK, HENRY WALTER, Jun., resigned Jan. 4, 1946.

TAYLOR, RICHARD LOUIS, Jun., resigned Dec. 31, 1945.

Applications for Admission or Transfer

Condensed Records to Facilitate Comment from Members to Board of Direction

FEBRUARY 1, 1946 NUMBER 2

The Constitution provides that the Board of Direction shall elect or reject all applicants for admission or for transfer. In order to determine justly the eligibility of each candidate, the Board must depend largely upon the membership for information.

Every Member is urged, therefore, to scan carefully the list of candidates published each month in CIVIL ENGINEERING *and to furnish the Board with data which may aid in determining the eligibility of any applicant.*

It is especially urged that a definite recommendation as to the proper grading be given in each case, inasmuch as the grading must be based upon the opinions of those who know the applicant personally as well as upon the nature and extent of his professional experience. Any facts derogatory to the personal character or professional reputation of an applicant should be promptly communicated to the Board.

Communications relating to applicants are considered strictly confidential.

The Board of Direction will not consider the applications herein contained from residents of North America until the expiration of 30 days, and from non-residents of North America until the expiration of 90 days from the date of this list.

MINIMUM REQUIREMENTS FOR ADMISSION

GRADE	GENERAL REQUIREMENT	AGE	LENGTH OF ACTIVE PRACTICE	RESPONSIBLE CHARGE OF WORK
Member	Qualified to design as well as to direct important work	35 years	12 years	5 years RCM*
Associate Member	Qualified to direct work	27 years	8 years	1 year RCA*
Junior	Qualified for subprofessional work	20 years	4 years	
Affiliate	Qualified by scientific acquirements or practical experience to cooperate with engineers	35 years	12 years	5 years RCM*

* In the following list RCA (responsible charge—Associate Member standard) denotes years of responsible charge of work as principal or subordinate, and RCM (responsible charge—Member standard) denotes years of responsible charge of IMPORTANT work, i.e., work of considerable magnitude or considerable complexity.

APPLYING FOR MEMBER

AMMANN, WERNER (Assoc. M.), Washington, D.C. (Age 39) (Claims RCA 4.2 RCM 5.1) Jan. 1941 to date with U.S. Navy, since June 1945 as Training Officer, Bureau of Yards & Docks, Washington D.C.; previously Structural Steel Designer, Bethlehem (Pa.) Steel Co.

BEARMAN, ALEXANDER ALFRED, New York City (Age 51) (Claims RCA 3.4 RCM 19.8) April 1930–Jan. 1931 Air-Conditioning Engr., and Dec. 1934 to date Head of Eng. Dept., Twentieth Century-Fox Film Corporation.

BENNION, VERNAL ROWLAND, College Park, Md. (Age 37) (Claims RCA 10.1 RCM 5.6) July 1931 to date with U.S. Geological Survey, since March 1945 as Dist. Engr.

BURTON, ALBERT HARVEY, Arlington, Va. (Age 43) (Claims RCA 1.1 RCM 8.8) July 1936 to Aug. 1939 and May 1943 to date with U.S. Engr. Office as Dist. Engr., Div. Engr., and Asst. to Dist. Engr.; in the interim with Office of Chief of Engrs., U.S. Army.

CANALS, JOSE MANUEL (Assoc. M.), San Juan, Puerto Rico. (Age 46) (Claims RCA 8.7 RCM 12.2) Sept. 1934 to date in private practice, designing and inspecting, valuation of properties, Expert Court Witness, Assessor of properties and adjusting fire losses.

CARD, FRANCIS CHARLES (Junior), Donelson, Tenn. (Age 36) (Claims RCA 2.4 RCM 5.2) Oct. 1940–May 1941 Asst. Constr. Supt., and Nov. 1945 to date Engr., E. I. du Pont Co., in

78,000 GALLONS PER MINUTE

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Municipalities aren't the only ones who must depend completely on reliable, large-scale water-pumping service. Many process industries rely on a continuous supply of water to keep output at peak level. This industrial plant, for example, required a flow of 78,000 gpm, pumped against a head of 180 feet. Most of the water was to be used for chemical processing on a continuous basis. Any lengthy interruption in service would jam production disastrously. In addition to getting the utmost reliability, the plant engineers wanted motors that would look as well as they behaved.

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SYNCHRONOUS MOTORS

the interim with CEC, U.S. Army, as 1st Lt., and Capt.

CARR, JOE MATT (Assoc. M.), Waco, Tex. (Age 41) (Claims RCA 6.7 RCM 6.1) Feb. to Nov. 1942 and Nov. 1945 to date San. Engr., State Health Dept., in the interim on active duty with U.S. Army, terminating as Major, San. Corps.; previously with state and local health departments, El Paso, Tex.

CHANEY, ADRIAN BYRON, Little Rock, Ark. (Age 53) (Claims RCA 7.7 RCM 17.0) July 1919 to date with Missouri Pacific R.R., and since July 1936 as Dist. Engr., Southern Dist.

COVERT, JOHN FRANCIS, San Diego, Calif. (Age 64) (Claims RCA 7.0 RCM 35.0) 1927 to 1934, 1938 to 1939, and 1940 to date Civ. and Hydr. Engr. (private practice), San Diego, Calif.; in the interim Engr. Inspector, California PWA; Disbursing Officer, Southern California, outside Los Angeles County.

CUMMINGS, EDWARD MARK, Bethlehem, Pa. (Age 49) (Claims RCA 3.4 RCM 22.5) Sept. 1923 to date Sales Engr., Bethlehem Steel Co.

DI GIACINTO, ALBERT GEORGE (Assoc. M.), Bronx, N.Y. (Age 35) (Claims RCA 0.5 RCM 10.7) Sept. 1937 to Aug. 1939, Jan. to May 1941, April 1943 to Sept. 1944 Engr., and May 1945 to date Senior Engr., Spencer White & Prentis, Inc., New York City; in the interim Gen. Supt., Sunswick Corporation; Supt., Subway Constr. Corporation; Engr., Drydock Associates at Norfolk, Va.; Chf. Engr., Spencer and Ross, Inc., at Hornell, N.Y.

DOW, ARTHUR LESTER, APO 757, New York City. (Age 52) (Claims RCA 10.0 RCM 11.7) Jan. 1943 to date Lt.-Col., Corps of Engrs., U.S. Army, since June 1945 as Chf., Maintenance & Supply Div., Inland Waterways Transport Service, TSFET-OCOT; previously Port Engr., Cherbourg, France, and 12th Major Port; Post Engr., Dow Field, Bangor, Me.; Chf. of Plant Protection Branch, First Corps Area, Boston; City Mgr., Rumford, Md.

DUBIN, EUGENE ARTHUR, Washington, D.C. (Age 35) (Claims RCA 4.3 RCM 6.2) Oct. 1941 to date Chf. of Structural Eng., Civil Eng. Div., USCG, Washington, D.C.; also (part of time) Associate and Lecturer, George Washington Univ.; previously Associate Structural Engr., PBA, FWA, Washington, D.C.

DUNLAP, ALBERT DUPELL, Indianapolis, Ind. (Age 45) (Claims RCA 8.4 RCM 6.6) June 1922 to date with State Highway Comm. of Indiana, since June 1942 as Engr. of Bridge Design, being Head of Bridge Design Dept.

ENGSTROM, WALLACE RICHARD (Assoc. M.), Cleveland, Ohio. (Age 47) (Claims RCA 5.8 RCM 15.0) June 1925 to date with the Austin Company, Seattle, Wash., and Cleveland, Ohio, since Jan. 1943 as Vice-Pres., in charge of Aviation Div.

FRIEDGEN, CLEMENS FRANCIS, Philadelphia, Pa. (Age 51) (Claims RCA 4.4 RCM 11.1) April 1934 to date with E. I. du Pont de Nemours & Co., Wilmington, Del., since Sept. 1945 as Group Supervisor.

GARRISS, CHARLES HENRY, Havelock, N.C. (Age 49) (Claims RCA 7.3 RCM 16.5) 1943 to date Civ. Engr., Bureau of Yards and Docks, Public Works Eng. Sec., Cherry Point, N.C.; previously with Olsen, Dietrick, Carr & J. E. Greiner Co., on airport work.

GARY, JESSE LEHMAN, East St. Louis, Ill. (Age 49) (Claims RCM 22.1) April 1919 to date with Illinois Div. of Highways, since Dec. 1923 as Dist. Engr. of Design.

GEORGE, HAROLD EDGAR, Pasadena, Calif. (Age 54) (Claims RCM 12.1) June 1943 to date Civil Engr., State Lands Comm., California; previously Asst. Structural Engr., Bureau of Power and Light, and Draftsman, Dept. of Recreation, City of Los Angeles.

GLIDDEN, HORACE KNIGHT, New York City. (Age 44) (Claims RCA 3.4 RCM 13.4) Jan. 1946 to date Eastern Editor, *Roads & Streets Magazine*, Gillette Publishing Co., Chicago, Ill.; previously with U.S. Dept. of Commerce.

GOULETTE, JEFFERSON DAVIS, JR., Fort Worth, Tex. (Age 40) (Claims RCM 17.4) June 1941 to Jan. 1943 and April 1945 to date with FWA, at present as Senior Civ. Engr., in the interim Capt., U.S. Marine Corps; previously Cons. Engr.

GRAY, NOMER (Assoc. M.), New York City. (Age 40) (Claims RCA 3.7 RCM 6.8) Feb. 1938 to April 1945 and Oct. 1945 to date with Dept. of Public Works, New York City, since Dec. 1939 as Civ. Engr.; in the interim Operations Analyst, U.S. Air Force, and Research Engr., Joint Target Group.

GREEN, GEORGE PINKNEY, Denison, Tex. (Age 40) (Claims RCA 6.4 RCM 6.6) March 1945 to date Engr., City of Denison, Tex., being City Engr., and Water & Sewage Supt.; previously, with U.S. Engrs., War Dept.; Engr., Hasie Eng. Co.

GURLEY, NORMAN BASSETT, Huntington, W.Va. (Age 55) (Claims RCA 5.5 RCM 24.4) May 1940 to date with West Virginia Steel & Mfg. Co., Huntington, W.Va., being Track Materials Sales and Service Engr., Priority Officer, and since Sept. 1945 Min. Engr.

HALL, JOHN FENWICK, Hampton, Va. (Age 35) (Claims RCA 0.8 RCM 4.6) July 1941 to date Major, Coast Artillery, U.S. Army; previously Asst. Chf. Field Engr., Widmer Eng. Co. of St. Louis, Mo.; with QM, Ft. Riley, Kans.

HARTMANN, AUGUST, Livingston, N.J. (Age 43) (Claims RCM 14.6) May 1945 to date Supt., Raymond-Morrison-Knudson Co., Maracaibo, Venezuela; previously Constr. Foreman, Koppers Constr. Co., Kearny, N.J.; Supervisor of Constr., James Stewart Co. Associates at Trinidad, B.W.I.; Traveling Supt., The Fatzler Co., Inc., Newark, N. J.

HILL, CHARLES LEONARD (Assoc. M.), Reno, Nev. (Age 53) (Claims RCA 6.4 RCM 9.0) Aug. 1939 to date Secy. & Mgr., Nevada Chapter of Associate Gen. Contractors of America, Inc.; previously City Engr., Reno.

HOLLISTER, LEONARD COCHRAN (Assoc. M.), Sacramento, Calif. (Age 47) (Claims RC 16.9 D 16.9) June 1927 to date with California Bridge Dept., since March 1933 as Senior Bridge Engr.

JOHNSTON, HENDON RUSSELL, Chattanooga, Tenn. (Age 39) (Claims RCA 6.0 RCM 6.6) 1933 to date with TVA, Knoxville, Tenn., since July 1943 as Chf., River Channel Improvement Div.

KATHPALIA, KRISHNA NARAIN, Lucknow, India. (Age 44) (Claims RCA 4.0 RCM 16.2) Oct. 1924 to date with Public Works Dept., United Provinces, India, since Oct. 1944 as Deputy Secretary to Government.

KELLEY, WILLIAM DENISON, Charleston, W.Va. (Age 44) (Claims RCA 1.1 RCM 21.3) Jan. 1942 to date with Ford, Bacon & Davis, Inc., being Constr. Engr. and Chf. Field Engr.; previously Cons. Engr., Beckley Water Co.

KINNIE, FRANK DAVIS, Topeka, Kans. (Age 59) (Claims RCA 5.6 RCM 24.2) 1906 to date with Atchison, Topeka & Santa Fe Ry. Co. in various positions, at present as Chf. Engr., Eastern Lines, Topeka, Kans.

LAMB, GEORGE WILLIAM (Assoc. M.), Topeka, Kans. (Age 45) (Claims RCA 12.1 RCM 10.1) Nov. 1945 to date Dist. Engr., American Institute of Constr., Inc.; previously with Kansas Highway Comm., from April 1939 to April 1942 and Nov. 1944 to Nov. 1945 as Bridge Engr.; in the interim with Missouri Valley Bridge and Iron Co., Evansville, Ind.

MCINTOSH, RODERICK JAMES, Bethlehem, Pa. (Age 52) (Claims RCA 1.4 RCM 22.5) Dec. 1922 to date with Bethlehem Steel Co., since Nov. 1928 as Mgr. of Sales, Steel Piling.

MAXEY, RUSSELL BENJAMIN (Assoc. M.), Columbia, S.C. (Age 39) (Claims RCA 4.1 RCM 6.7) Nov. 1943 to date Instructor, School of Eng., Univ. of South Carolina; previously with U.S. Engr. Dept.; with TVA.

MERRILL, EDWARD ATKINSON, Chicago, Ill. (Age 45) (Claims RCA 3.3 RCM 17.7) Oct. 1945 to date Project Mgr., Skidmore, Owings & Merrill, Archts., Chicago, Ill.; previously with Corps of Engrs., U.S. Army, final rank being Lt. Col.

MILLER, JOHN EDWARD (Junior), Lansing, Mich. (Age 35) (Claims RCA 3.2 RCM 5.4) July 1936 to date with Bureau of Eng., Michigan Dept. of Health, since Dec. 1944 as Class IV Service Engr.

MORRISON, WALTER GORDON (Assoc. M.), Christchurch, New Zealand. (Age 42) (Claims RCA 3.4 RCM 11.2) Oct. 1939 to date with Royal Engrs., as SP, then Lt. Col. in Egypt and India, and since Sept. 1945 Army Representative on Damodar Valley Development, India; previously in partnership with a consulting engineer, Christchurch.

NIELSEN, EDWIN GEORGE, Boulder City, Nev. (Age 40) (Claims RCA 6.5 RCM 7.6) Feb. 1934 to date with Bureau of Reclamation, since June 1945 as Regional Planning Engr., Region III.

PANUZIO, FRANK LOUIS (Assoc. M.), Bridgeport, Conn. (Age 38) (Claims RCA 4.0 RCM 6.3) Nov. 1936 to date with War Dept., U.S. Engr. Office, New York Dist., since Sept. 1944 as Senior Engr. to Principal Engr.

PAYNE, HARRY DANIEL, Houston, Tex. (Age 54) (Claims RCA 3.0 RCM 20.7) July 1927 to date in private practice as Architect and Engineer; previously Superv. Arch., Houston (Tex.) Independent School Dist.

RAU, JOHN AUGUST, Phoenix, Ariz. (Age 38) (Claims RCA 5.0 RCM 7.0) Summer 1927 to date with Allison Steel Mfg. Co., at present as Chief Engr.

READY, WILLIAM CHARLES, Baltimore, Md. (Age 46) (Claims RCA 4.9 RCM 18.5) Aug. 1940 to date with Corps of Engrs., U.S. Army, since April 1942 as Lt. Col.

RIDDICK, THOMAS MOORE (Assoc. M.), New York City. (Age 38) (Claims RCA 2.1 RCM 9.1) Dec. 1936 to date Cons. Engr. & Chemist, New York City, being Consultant to various sewer and water departments.

WELLS, JOSEPH VAN BRUNT (Assoc. M.), Louisville, Ky. (Age 39) (Claims RCA 5.4 RCM 6.4) Oct. 1929 to date with U.S. Geological Survey, since March 1940 as Dist. Engr., Kentucky.

WILLIAMS, LLOYD J, Omaha, Nebr. (Age 49) (Claims RCA 8.9 RCM 10.6) Sept. 1922 to date with Omaha Steel Works in various capacities, since Jan. 1942 as Executive Engr.

WOOD, CARROLL LEE, JR., New Orleans, La. (Age 37) (Claims RCA 2.5 RCM 13.2) Jan. 1941 to May 1942, Sept. 1945 to date with Louisiana Parks Comm., since Nov. 1945 as Cons. Engr.; since Nov. 1945 also Engr. for Perrilliat-Rickey Constr. Co., New Orleans; in the interim, Lt. Col., Battalion Comdr., Corps of Engrs., U.S. Army.

APPLYING FOR ASSOCIATE MEMBER

ALSPAUGH, ALTON EMANUEL, Portland, Ore. (Age 30) (Claims RCA 3.9 RCM 0.5) 1939 to date with U.S. Engr. Office at Bonneville and Portland, Ore., since March 1944 as Associate Engr.

BACON, VINTON WALKER (Junior), Atlanta, Ga. (Age 29) (Claims RCA 3.3) June 1943 to date Asst. San. Engr., Reserve Corps, U.S. Public Health Service; previously Designer, Los Angeles County San. Dists.; Jun. Engr., East Bay Cities Sewage-Disposal Survey, Berkeley, Calif.

BALALA, BEN (Junior), Sacramento, Calif. (Age 34) (Claims RCA 4.0) April 1932 to Feb. 1933 and Nov. 1933 to date with State of California, Div. of Highways, and Bridge Dept., finally as Asst. Bridge Engr.; since Jan. 1946 Structural Engr., Div. of Architecture.

BOND, ATWELL MADISON, Denver, Colo. (Age 35) (Claims RCA 0.6 RCM 3.9) Dec. 1945 to date Head, Roads and Runways Sec., Port Engrs. School, Army Air Forces, Buckley Field, Colo.; previously Field Service Engr., Office of Service Command Engr., Ninth Service Command, Fort Douglas, Utah; with U.S. Engr. Dept., finally as Civ. Engr., Miami Dist. Engr.'s Office; Asst. Res. Engr., Pan American Airways, ADP; Supt. of Constr. and Maintenance, Office of QM, U.S. Army, Fort Brown, Tex.; with Texas Highway Dept.

BOYER, HENRY FRANK (Junior), Lebanon, Pa. (Age 34) (Claims RCA 3.3), Nov. 1940 to Nov. 1941 and March 1942 to date with Corps of Engrs., U.S. Army, being 1st Lt., and (since Feb. 1943) Capt.; in the interim with Bressler Metal Works, Lebanon, Pa.

BRUDENELL, ROSS NYMAN (Junior), Chattanooga, Tenn. (Age 35) (Claims RCA 9.7 RCM 1.3) July 1934 to date with TVA, since Feb. 1943 as Power Supply Engr.

BURNHAM, JOHN REED, Vallejo, Calif. (Age 33) (Claims RCA 3.8 RCM 6.0) April 1936 to date with Solano County, Calif., as Chf. Deputy County Surveyor, and since Jan. 1942 County Surveyor.

BYRD, KENNETH DAVIS (Junior), Heflin, Ala. (Age 27) (Claims RCA 2.7) at present Civ. Engr., J. W. Goodwin Eng. Co., Mun. and Cons. Engrs., Birmingham, Ala.; Aug. 1941 to Oct. 1945 with Corps of Engrs., U.S. Army, being 2d Lt., 1st Lt., and Capt.; previously with Tennessee Coal Iron & R.R. Co., Birmingham.

CALDWELL, DAVID HUME, Oakland, Calif. (Age 31) (Claims RCA 2.0 RCM 1.9) Feb. 1944 to date Senior Sanitary Engr., 12th Naval Dist.; previously Assoc. Sanitary Engr., Ninth Service Command, U.S. Army; Asst. San. Engr., California Dept. of Health; Instructor in Civ. Eng., Univ. of Illinois.

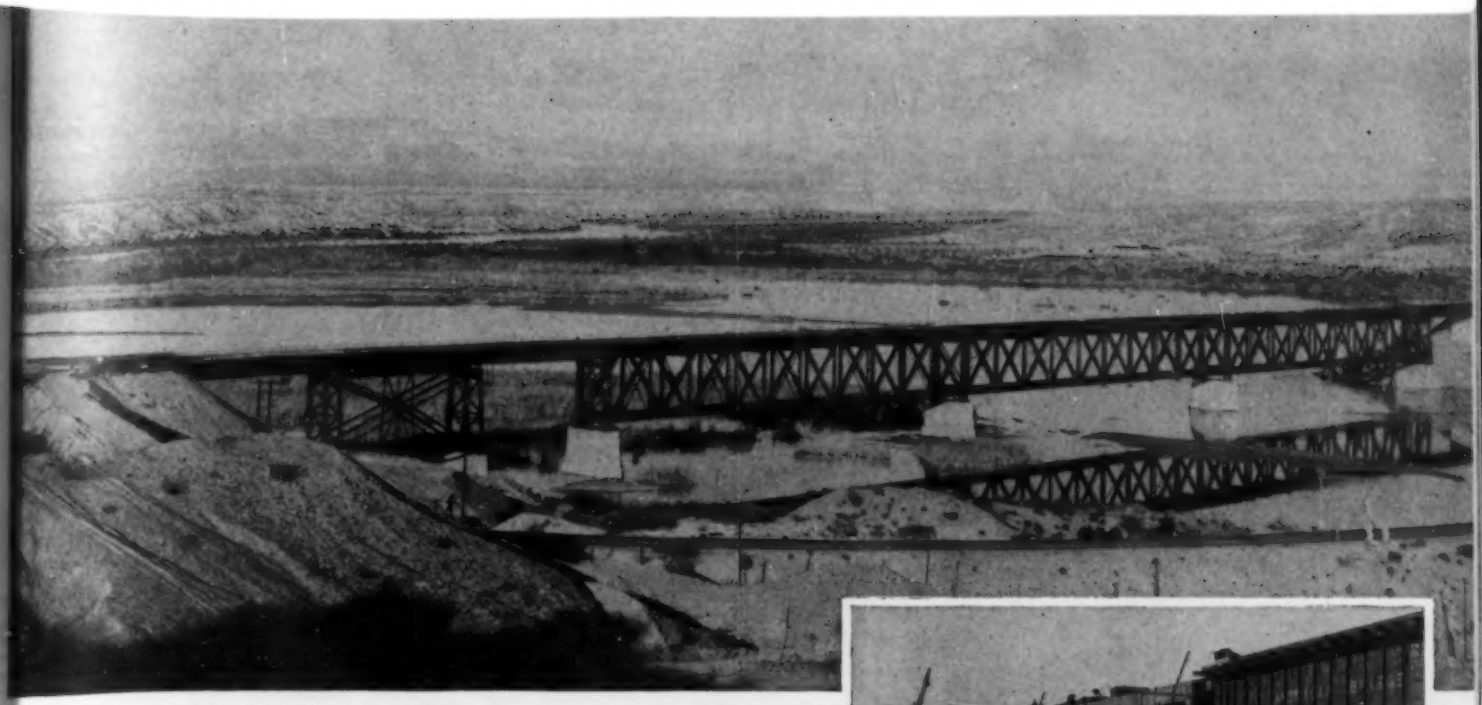
CHAN, LOUIS (Junior), Oakland, Calif. (Age 31) (Claims RCA 2.8 RCM 1.0) Aug. 1939 to date with U.S. Engrs., since Sept. 1944 as 2d Lt., Corps of Engrs., Army Map Service, being Tech. Operations Officer, Cartographic Div.

COLBY, ROY LYNN, JR., Detroit, Mich. (Age 28) (Claims RCA 1.5) April 1941 to date Structural Engr., Stran Steel Div., Great Lakes Steel Corporation, Detroit, Mich.

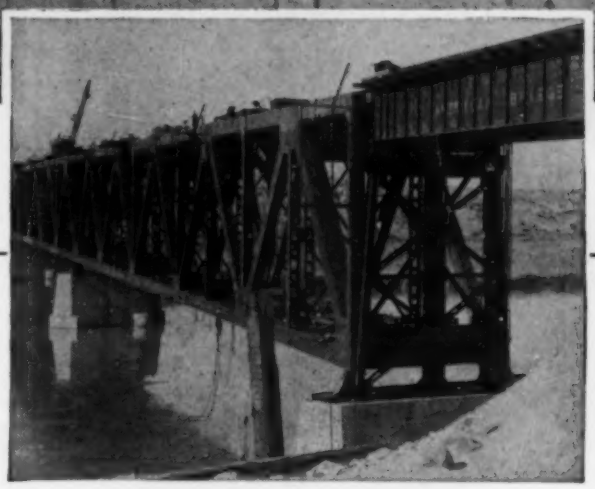
CULLMER, ROBERT EDWARD (Junior), San Diego, Calif. (Age 34) (Claims RCM 5.6) Aug. 1942 to date in private practice as Licensed Land Surveyor, La Mesa Eng. Service; previously Special Inspector, San Diego Gas & Elec. Co., Gas Distribution Dept., San Diego, Calif.; Instructor, San Diego (Calif.) Vocational High School and Junior Coll.

DAVIS, JOHN PRINCETON, Louisville, Ky. (Age 34) (Claims RCA 3.0) June 1940 to date with U.S. Engr. Dept., Louisville, Ky., since Nov. 1944 as Hydr. Engr.; previously Asst. Engr., Jennings-West Walnut Manor Sewer Dist., St. Louis, Mo.

DREMER, ARTHUR P., JR. (Junior), Pittsburgh, Pa. (Age 34) (Claims RCA 2.1 RCM 4.8) Sept. 1938 to Sept. 1940 Engr., and April 1945 to date Res. Engr., Morris Knowles, Inc., Pittsburgh, Pa., in



SANTA FE's new, high-level Topock Bridge replaces an old through-truss cantilever crossing of the Colorado River. The old bridge (not shown) is located at the extreme right end of the curving alignment of the low-level roadbed in the foreground. The new, ballasted-deck structure consists of three, 350-foot deck truss spans over the main channel with plate girder approaches to the east and west, respectively 150 and 300 feet long. The steel superstructure was fabricated and erected by American Bridge Company.



IMPRESSIVE ENGINEERING FEAT... *removes a "bottleneck"*

THE new Colorado River Crossing of the Atchison, Topeka and Santa Fe near Topock, Arizona, is one of the outstanding bridge construction projects of recent years. This modern, double-track bridge, replacing a 55-year old single-track structure, now speeds vital traffic to California's ports of war.

Built in the days of lighter rolling stock and slower speeds, the "old-timer" was twice reinforced to meet progressive increases in loadings. But this single-track link in an otherwise double-tracked line, formed a "bottleneck" on a railroad which handles an important share of the record burden of transcontinental wartime traffic.

The new Topock Bridge eliminates the "bottleneck." Its design and construction embody engineering developments that contribute to permanence and to the strength and ruggedness necessary to meet today's and tomorrow's heavy power, traffic density and high speed operations. It is the major element of a greatly improved roadbed alignment which reduces by some 327 degrees in central angle the amount of total curvature inherent in the older line.

The developments and accomplishments of wartime "railroading" will be influencing factors of postwar competition. And transportation projects such as this Topock Bridge point the way to the coming job of roadbed rehabilitation. When the railroads' postwar jobs shape up, American Bridge will be prepared with vastly greater resources and experience, to meet their every structural need.

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DODSON, LEWIS, Dallas, Tex. (Age 43) (Claims RCA 8.3 RCM 3.1) Oct. 1943 to date Chf., Maintenance & Repair Branch, Hq. Eighth Service Command, Corps of Engrs.; previously Chf., San. Sec., U.S. Engrs., Albuquerque, N.Mex.; San. Consultant with Texas State Dept. of Health; San. Engr. Instructor, Texas Dept. of Vocational Education.

DOLL, WARWICK LEWIS, Rolla, Mo. (Age 36) (Claims RCA 5.0 RCM 0.3) Jan. 1943 to date with Corps of Engrs., U.S. Army, being Capt. and Major; previously Asst. Prof., Missouri School of Mines, Rolla.

DRISCOLL, JOHN EDWARD, Arlington, Va. (Age 37) (Claims RCA 5.3 RCM 1.0) Aug. 1945 to date Special Research Engr., The Asphalt Inst., New York City; previously Asst. Civ. Engr., Dept. of Commerce, CAA, New York City; Senior Eng. Aide, New York State Div. of Highways, Babylon, N. Y.

DRUMMOND, DONALD HOLLAND, Red Bank, N.J. (Age 30) (Claims RCA 1.0 RCM 4.1) 1943 to date with U.S. Navy; previously Design Engr. with Williams, Coyle & Pipino, Archts. & Engrs., Newport News, Va.; with Harland Bartholomew & Associates, St. Louis, Mo.; with Johns Manville Sales Corporation, St. Louis, Mo.; with Henry J. Kaiser Co., Oakland, Calif.

ERICKSON, HARRY WILBERT (Junior), Seattle, Wash. (Age 34) (Claims RCA 5.1 RCM 4.6) June 1938 to date Civ. Engr., U.S. Engr. Dept., Seattle, Wash.

FEINDT, MARY CLARISSA BASTIAN (MRS.) (Junior), Charlevoix, Mich. (Age 29) (Claims RCA 1.3) June 1938 to Feb. 1941, June 1941 to Feb. 1944 and June 1944 to date with Charlevoix Abstract & Eng. Co., and since Oct. 1944 as Owner; in the interim graduate student.

FOLTZ, FRANKLIN J. (Junior), Phoenix, Ariz. (Age 34) (Claims RCA 6.2 RCM 4.2) Dec. 1940 to date Chf. Draftsman, Allison Steel Mfg. Co., Phoenix; previously with Salt River Valley Water User's Association, Phoenix.

FRAIL, ROGER GRANT (Junior), Montpelier, Vt. (Age 27) (Claims RCA 5.0) Feb. 1941 to date with U.S. Army, in various capacities and 2½ years as Major; previously Steel Designer-Draftsman, Stone & Webster Eng. Corporation, Boston, Mass.

FRERIKS, FREDERIK GERHARD, Altadena, Calif. (Age 31) (Claims RCA 1.0) Aug. 1942 to date with Douglas Aircraft Co., Santa Monica, Calif., since Oct. 1943 as Liaison Engr., and (later) Prof. Engr.; previously with Southern California Telephone Co., Los Angeles, Calif.

FU-LIANG, HU, Knoxville, Tenn. (Age 35) (Claims RCA 9.0) Nov. 1945 to date visiting United States to study water power projects, at present with TVA; previously with Natl. Resources Commission of China.

GILCHRIST, FRANK (Junior), Dallas, Tex. (Age 27) (Claims RCM 1.6) July 1939–Jan. 1941 and Dec. 1945 to date with City of Dallas, Tex., since Dec. 1945 as Jun. Engr., Water Dept., in the interim with Corps of Engrs., finally as Lt. Col., U.S. Army.

GLENDENING, PAUL FREDERICK (Junior), Glendale, Ariz. (Age 35) (Claims RCA 7.8) Feb. 1943 to date Lt., CEC, USNR, Bureau of Yards and Docks, Navy Dept., Washington, D.C., at present on terminal leave.

GRAVES, LEROY DONALD, Cincinnati, Ohio. (Age 33) (Claims RCA 5.5 RCM 1.2) Nov. 1941 to date successively Asst. Engr., Associate Engr., and Engr., U.S. Army Engrs.; previously with Joint Highway Research Project at Purdue Univ.

GREGORY, ROBERT ELMO, Shreveport, La. (Age 38) (Claims RCA 3.6) June 1943 to date Jun. Associate Engr., Civ. Eng. Dept., Arkansas Natural Gas Cos., Shreveport, La.; previously with Arkansas Louisiana Gas Co., Shreveport.

GROVE, EMERY CHESTER, Topeka, Kans. (Age 40) (Claims RCA 12.4 RCM 2.0) Dec. 1933 to date with Kansas Highway Comm., since Dec. 1943 as Bridge Designer.

HAASE, JOHN ALOYSIUS, III (Junior), New Orleans, La. (Age 34) (Claims RCA 2.3) Nov. 1942 to date with U.S. Maritime Comm., since Sept. 1944 as Naval Archt.; previously Jun. Mech. Engr., War Dept., U.S. Engrs.; Estimating Engr., with CWA and ERA.

HALLUM, JOHN STEWART, Pierre, S.Dak. (Age 36) (Claims RCA 7.8 RCM 2.1) Jan. 1938 to Dec. 1941 Bridge Designer, and Jan. 1944 to date Designing Engr., Texas Highway Dept.; in the interim Designer, Tennessee Highway Dept.

HART, MELVIN LEE, Tulsa, Okla. (Age 34) (Claims RCA 3.5 RCM 1.2) Nov. 1944 to date Chf. Engr., Pate Eng. Co., Tulsa, Okla.; previously with U.S. Army Engrs., Tulsa (Okla.) Dist. Office, finally as Associate Engr. (Civ.)

HOFFMAN, ROBERT FRANCIS (Junior), St. Petersburg, Fla. (Age 34) (Claims RCA 4.3 RCM 3.9) June 1941 to date with U.S. Army, at present as Lt. Col.; previously with TVA.

HOLLERAN, LESLIE GILBERT, JR. (Junior), New Rochelle, N. Y. (Age 34) (Claims RCA 9.7) May 1943 to date with CEC, USNR, as Lt.(jg), and Lt., at present on terminal leave; previously with Turner Constr. Co., New York City, being Constr. Engr., and Asst. Supt. of Constr.; with Woodcrest Constr. Co., New York City.

HOLLIS, JACK E., Los Angeles, Calif. (Age 38) (Claims RCA 4.4 RCM 0.5) Sept. 1940 to Dec. 1941 and Sept. 1945 to date with California Div. of Highways, since Sept. 1945 being Asst. Engr. at Eureka, Calif.

HUFF, GEORGE RUSSELL (Junior), Kansas City, Mo. (Age 34) (Claims RCA 3.2 RCM 2.3) Oct. 1945 to date Civ. Engr. and Supervisor of Service, Eng. Div., Kansas City (Mo.) Water Dept.; previously Officer, 9th Infantry Div.; Engr., Twisp, Wash.

IRWIN, HARRY FUNSTON, Lansdowne, Pa. (Age 39) (Claims RCA 11.8) Nov. 1945 to date Design Engr. with Louis H. Doane, Wilmington, Del.; previously Office Engr., Portland Cement Association, Philadelphia, Pa.; Concrete Supervising Engr., Delaware Testing Laboratory, Inc., Dover, Del.

JACOBS, BRUCE BOYNTON, Oak Ridge, Tenn. (Age 34) (Claims RCA 5.0) Aug. 1942 to date with U.S. Engrs., since Jan. 1944 as Office Engr. Oak Ridge, Tenn.; previously Jun. Engr., Rochester & Lake Ontario Water Service Corps, Rochester, N.Y.

JORGENSEN, JAMES FRANK, San Diego, Calif. (Age 35) (Claims RCA 1.5 RCM 3.7) May 1931 to date with California Div. of Highways, since May 1942 as Associate Highway Engr. at San Diego.

KALTENECKER, LESTER VICTOR, Elmhurst, N.Y. (Age 30) (Claims RCA 4.1 RCM 0.6) July 1940 to date with Chemical Constr. Corporation, New York City, in various capacities; Sept. 1941 to Sept. 1944 also Instructor in Eng., Science and Management War Training Courses, Manhattan Coll.

KURRASCH, JOHN HAROLD, Louisville, Ky. (Age 46) (Claims RCA 1.4 RCM 8.6) May 1924 to Sept. 1925, Sept. 1927 to March 1933 and July 1933 to date with U.S. Engr. Office, since Jan. 1939 as Engr.; in the interim Planning Engr., ERA; Office Engr., Prairie Oil & Gas Co.; Draftsman, Producers & Refiners Corporation; Engr., Golden Gate Development Co.

LEACH, LAURENCE GAY (Junior), Atlanta, Ga. (Age 35) (Claims RCA 1.0 RCM 2.3) Oct. 1936 to date with U.S. Engr. Office, since Oct. 1943 as Senior Engr., South Atlantic Div. Office, Atlanta, Ga.

LOHMANN, ALEXANDER WILLIAM (Junior), Syracuse, N.Y. (Age 35) (Claims RCA 3.3 RCM 1.0) Nov. 1935 to date with U.S. Engrs. Office, since Jan. 1942 at Syracuse, N.Y., as Associate Engr.

LOVERING, WENTWORTH REYNOLD, Sacramento, Calif. (Age 35) (Claims RCA 9.2) June 1929 to date with California Div. of Highways since April 1944 as Associate Physical Testing Engr.

LUCAS, FRANK EARL (Junior), Altadena, Calif. (Age 34) (Claims RCA 5.6) Jan. 1943 to date with U.S. Navy as Lt.(jg) and since March 1944 as Lt., being Company Commander Naval Constr. Bn., previously with U.S. Engr. Office, Portland, Ore.

MCCLUSKEY, WILLIAM OLIVER, III (Junior), Mojave, Calif. (Age 32) (Claims RCA 8.9) Sept. 1942 to Feb. 1943 Lt.(jg), and Feb. 1943 to date Lt. and Lt.-Comdr., CEC, USNR, being Public Works Officer and Res. Officer, Marine Corps Air Station, Mojave, Calif.; previously with Truscon Steel Co., Youngstown, Ohio.

MCCORD, MARSHAL (Junior), Baltimore, Md. (Age 28) (Claims RCA 1.7) May 1941 to Sept. 1945 with 95th Gen. Service Regt., Corps of Engrs., U.S. Army, after June 1944 Regt. Executive Officer; at present on terminal leave; previously Senior Bridge Draftsman, Maryland Roads' Com., Baltimore.

MCKEE, KENNETH HENRY (Junior), Cincinnati, Ohio. (Age 34) (Claims RCA 4.9 RCM 1.0) Nov. 1933 to date with U.S. Engr. Dept., at present as Asst. Engr., Ohio River Div., Laboratories(formerly Cincinnati Testing Laboratory).

MALONE, RICHARD CASE, Laguna Beach, Calif. (Age 35) (Claims RCA 2.2) May 1945 to date Asst. to Chf. Engr., Haddock-Engrs., Ltd., Naval Ordnance Test Station, Inyokern, Calif.; previously short engagements with various companies such as Shannahan Bros., Inc., Kistner, Curtis & Wright, U.S. Navy, etc.

MARTIN, JOHN EDWARD (Junior), Los Angeles, Calif. (Age 29) (Claims RCA 5.0 RCM 1.1) April 1942 to date with CEC, USNR, since July 1944 as Lt.; previously Laboratory Technician, Testing Laboratory, Raymond G. Osborne; Jun. Structural Engr. with Albert C. Martin, Archt. Engr.

MATHIS, SAMUEL JACKSON (Junior), Columbia, S.C. (Age 33) (Claims RCA 2.8 RCM 1.9) April 1941 to date with CEC, USNR, since Aug. 1945 Commdr. being Executive Officer, Procurement Office, Bureau of Yards & Docks, closing office; previously Office Asst. to State Hwy. Main. Engr., South Carolina Highway Dept.

MESERVE, EARL CHARLES (Junior), Little Rock, Ark. (Age 32) (Claims RCA 4.8) June 1941 to date with War Dept., U.S. Engrs., since Jan. 1943 as Hydr. Engr., Little Rock, Ark.; previously Asst. Technician, Dept. of Agriculture, SCS, St. Louis, Mo.

MICHELS, VLADIMIR STEPHEN, Melbourne, Australia. (Age 27) (Claims RCA 2.0) Dec. 1938 to March 1942 and Oct. 1943 to date with State Rivers and Water Supply Comm., Victoria; in the interim Civ. Engr., Dept. of Interior, Victorian Directorate, Works & Services Branch, Civ. Eng. Sec.

PETERSON, CARL HILMER, JR. (Junior), Arlington, Va. (Age 32) (Claims RCA 5.3) June 1942 to date with U.S. Army, since June 1945 as Capt.; previously Field Superv. Engr., Fraser, Brace Eng. Co., New York City; Field Engr., E. T. Archer & Co., Kansas City, Mo.

PORTER, HAYDEN SAMUEL, Newtown, Ohio. (Age 37) (Claims RCA 4.2 RCM 4.6) March 1936 to date Asst. to Plant Engr., The Cincinnati Milling Machine Co.

PURDOM, PAUL WALTON (Junior), Nashville, Tenn. (Age 28) (Claims RCA 2.6 RCM 1.9) Sept. 1943 to date Senior San. Engr., Tennessee Dept. of Public Health, Nashville, Tenn.; previously with Georgia Dept. of Public Health; with U.S. Engr. Dept.; with Union Bag and Paper Corporation; with Colquitt County Board of Health, Moultrie, Ga.

REDMOND, JOHN, JR. (Junior), Army Air Field, Marfa, Tex. (Age 27) (Claims RCA 5.1) Aug. 1943 to date Lt., San. Corps, U.S. Army; previously Asst. San. Engr. (P-2), War Dept., Tyndall Field, Fla.; San. Officer (County Unit), Alabama Health Dept.

RICHARDS, WELDON LOUIS (Junior), Berkeley, Calif. (Age 34) (Claims RCA 4.0) May 1942 to date Asst. Estimator and Engr., The Austin Co., Engrs. and Bldrs.; previously, Inspector of Constr., Benetia Arsenal Extension, California; Sanitary Engr., East Bay Cities Sewage-Disposal Survey.

RIZZI, ANTHONY VINCENT (Junior), Jamaica, N.Y. (Age 29) (Claims RCM 3.5) Sept. 1936 to Dec. 1941 and Oct. 1945 to date with Dept. of Civ. Eng., Coll. of City of New York; in the interim with Corps of Engrs., U.S. Army, as 1st Lt., Capt., and Major.

ROBINSON, LORLIN BURL, Galveston, Tex. (Age 48) (Claims RCA 24.5) Aug. 1941 to date with U.S. Engr. Office, Galveston, Tex., since Feb. 1945 as Senior Engr.; previously with Dept. of Agriculture, Forest Service, Houston, Tex.

ROGERS, SHERMAN LEFFINGWELL, Wethersfield, Conn. (Age 40) (Claims RCA 8.0 RCM 1.0) Jan. 1930 to date with Eng. Dept., Water Bureau, Metropolitan Dist., Hartford County, finally as Asst. Supt.

ROSENVINGE, CEDRIC LOUIS, Hong Kong. (Age 30) (Claims RCA 9.2) Dec. 1942 to date Officer, RAF Airfield Constr. Service, being Squadron Leader; previously Engr.-Agent for Taylor Woodrow Constr. Ltd., of London and New York; Asst. Res. Engr., D. Balfour & Sons, Cons. Civ. Engrs.

RUDISILL, CLAYTON PAUL, Hampton, Iowa. (Age 54) (Claims RCA 25.6) Jan. 1930 to date County Highway Engr., Highway Dept., Franklin County, Iowa.

SALTMAN, ARMAND (Junior), Los Angeles, Calif. (Age 28) (Claims RCA 1.5 RCM 2.0) June 1945 to date with U.S. Army, Fort Lewis, Wash., assigned to 349th Eng. Constr. Bn.; previously, Chief Structural Designer, Gen. Eng. Service Co., Los Angeles, Calif.

SAYLER, FRANCIS ALBERT (Junior), Los Angeles, Calif. (Age 34) (Claims RCA 5.5) Oct. 1945 to date Cons. Engr., Los Angeles, Calif.; previously Superv. Structural Engr., Holmes & Narver, Cons. Engrs., Los Angeles; Senior Structural Engr., California Shipbuilding Corporation, Wilmington, Calif.; Structural Engr., U.S. Engr. Dept., Los Angeles Branch; with Los Angeles County Dept. of Building & Safety.

SCHAILL, HAROLD ARTHUR (Junior), Asheville, N.C. (Age 32) (Claims RCA 3.0) March 1941 to date Officer, U.S. Army, at present being Major, CAC (anti-aircraft); previously Jun. Hydr. Engr. and Asst. Hydr. Engr. Hydr. Data Div., TVA, Knoxville, Tenn.

SCHULTZ, HAROLD BRYANT, Ames, Iowa. (Age 43) (Claims RCA 8.0) May 1927 to Oct. 1942 and Oct. 1945 to date Bridge Designer, Iowa Highway Comm.; in the interim Associate Structural Engr., PBA, FWA; Structural Engr., Engr. Bd., War Dept., Ft. Belvoir, Va.

STIEMKE, ROBERT EDWARD (Junior), Raleigh, N.C. (Age 30) (Claims RCA 3.2 RCM 1.7) Sept. 1942 to July 1944 and Nov. 1945 to date Associate Prof. of San. Eng., North Carolina State Coll.; in the interim P.A. San. Engr. (R), U.S. Public Health Service; previously Instructor, Wayne Univ. and Designer and

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SWANSON, FRANK ELMER (Junior), San Francisco, Calif. (Age 34) (Claims RCA 5.1 RCM 1.8) Nov. 1940 to date with CEC, U.S. Navy, since July 1945 as Comdr. at Eastern Pacific Docks, San Francisco, Calif.

TACKE, WALTER HENRY, Milwaukee, Wis. (Age 37) (Claims RCA 9.3 RCM 1.3) July 1936 to date with City of Milwaukee, since Oct. 1943 as Field Supervisor, Bureau of Street Constr.

TRIAY, CHARLES ROLAND, JR. (Junior), Los Angeles, Calif. (Age 35) (Claims RCA 4.7) July 1935 to date with Los Angeles Dept. of Water and Power, since 1943 as Civ. Eng. Associate.

TRIVELY, ILO ALLELV, Clemson, S.C. (Age 39) (Claims RCA 3.5) Sept. 1941 to date at Clemson Coll., S.C., being Instructor and since July 1942 Asst. Prof. of Civ. Eng.; previously Instructor in Civ. Eng., Univ. of Nebraska.

VREELAND, ROBERT PAUL, JR. (Junior), Hamden, Conn. (Age 34) (Claims RCA 5.7) Jan. 1941 to June 1942 and Nov. 1945 to date Instructor, School of Eng., Yale Univ.; in the interim with U.S. Army Services of Supply, Southwest Pacific Area as 1st Lt., Capt., and Maj.

WAGNER, WARREN ORVAL (Junior), Pasadena, Calif. (Age 35) (Claims RCA 4.8 RCM 2.4) Feb. 1945 to date Asst. Prof. of Hydraulics and since June 1945 also Project Supervisor, California Inst. of Technology; previously member of firm, Dunton-Wagner Lumber Co., Keller, Wash.; Executive Vice-Pres. and Engr.-in-Charge, Machinery, Chemical & Supply Co., Ltd., Honolulu, Hawaii; CMP Engr. and Asst. Project Mgr. for Procurement; Acting Personnel Dir., Personnel Dir. and Personnel Mgr.-Contrs., Pacific Naval Air Bases, Pearl Harbor.

FOR AFFILIATE

BUSCHEN, HENRY ANTON, Scarsdale, N.Y. (Age 48) (Claims RC 7.0) 1915 to date with Thompson-Starrett Co., Inc., New York City, and since 1938 Mgr. of Eng. Dept.

WAGNER, ALLEN JOSEPH, New York City. (Age 42) (Claims RCA 12.1) Nov. 1945 to date Asst. to Secy., ASCE; previously Asst. to Secy., Minnesota Mining & Mfg. Co., St. Paul, Minn.; Exec. Secy., Minneapolis–St. Paul San. Dist.

APPLYING FOR JUNIOR

CHAI, WEI HAO, Chicago, Ill. (Age 30) Feb. 1945 to date Trainee, Chicago, Burlington & Quincy R.R.; previously with Chinese National Kikiang Ry., being Student Engr. and Asst. Engr.; with Chinese National Yunnan-Szechuan Ry.

CUTHILL, JOHN ROBERT, Buffalo, N.Y. (Age 27) Sept. 1936–April 1941 and Nov. 1945 to date Structural Steel Draftsman, R. S. McMannus Steel Constr. Co., Inc.; in the interim with Corps of Engrs., U.S. Army.

KENT, CLIFTON THORNE, Camp Hill, Pa. (Age 33) (Claims RCA 4.5) April 1942 to date with U.S. Army, as 1st and Capt., 62nd Engr. Topographic Co., and since July 1945 Chf. of Survey Sec., Mapping Branch, Engr. Board, Ft. Belvoir, Va.; previously Jun. Naval Archt. and Prin. Eng. Draftsman, Philadelphia Navy Yard.

MAGA, JOHN ANTHONY, San Mateo, Calif. (Age 30) (Claims RCA 0.7) Feb. 1942 to Nov. 1945 Lt., U.S. Navy, being Personnel Officer, Aerology Officer; previously Jun. San. Engr., State of Calif.; Asst. Engr., East Bay City Sewage Survey.

MILLER, LEO, Akron, Ohio. (Age 27) (Claims RCA 1.7) Oct. 1942 to date with Goodyear Aircraft Corporation, Akron, Ohio, on reports, Advisor to Salvage Boards, stress analysis, etc.

PENDLETON, JAMES LAKE, Yakima, Wash. (Age 28) at present with U.S. Army.

SEZER, ILHAN ARIF, Knoxville, Tenn. (Age 24) Feb. 1945 to date with Training Div., TVA, Knoxville, Tenn., Design Dept.; previously student.

SWISHER, JAMES MARK, Cleveland, Ohio. (Age 27) (Claims RCA 1.8) Oct. 1945 to date Engr. with Mark Swisher, Industrial Engr. and Gen. Contr.; previously with Eng. Dept., Boeing Aircraft Co., Seattle, Wash.

1944 GRADUATES

UNIV. OF CAPE TOWN
(B.Sc.E.)

	AGE
POWRIE, WALTER EUSTACE	(21)

PURDUE UNIV.
(B.S.)

BEARD, JAMES RICHARD	(24)

VA. POL. INST.
(B.S.C.E.)

BARGER, CHARLES WILLIAM, JR.	(23)

1945 GRADUATES

CASE SCHOOL OF APPLIED SCI.
(B.S.)

HOBAN, JOSEPH RICHARD	(30)
BURTON, WILLIAM WALLACE	(21)

UNIV. OF COLO.
(B.S. in C.E.)

BURFIELD, JAMES ARNOLD	(20)
ENEWOLD, LEE ROY	(21)
LOOK, ROBERT GLENN	(20)

GA. SCHOOL TECH.
(C.E.)

FURMAN, HAL MYRON	(29)

ILL. INST. TECH.
(B.S. in C.E.)

DANIELSON, EARL JUNIOR	(21)

IOWA STATE COLL.
(B.S. in C.E.)

NEBLETT, STERLING RIVES, JR. (M.S.)	(25)
STEIN, ROBERTO	(24)

(Also M.S. in Meteorology, Calif. Inst. Tech.)

LEHIGH UNIV.
(B.S. in C.E.)

FACCHIANO, PETER PASQUALE	(22)

OHIO STATE UNIV.
(B.C.E.)

BROWN, ELGAR PARNELL	(27)

RENS. POL. INST.
(B.C.E.)

GRAHAM, MALCOLM DOUGLAS	(21)
HOAK, FRANK WILLIAM	(21)

ROSE POL. INST.
(B.S.C.E.)

WALDBIESER, WILLIAM CARL	(21)

UNIV. OF SO. CALIF.
(B.E. in C.E.)

CONNER, ROBERT EDWARD	(21)
DICKMAN, NORMAN HENRY	(20)
HIRST, DANIEL LEE	(20)
KUHN, BENJAMIN WALKER, JR. (Also 1942 B.A., Stanford Univ.)	(25)
LANOUETTE, KENNETH HERBERT, JR.	(20)
MOST, BURTON BOURDON	(20)
SODERBERG, RICHARD REUBEN	(22)
THOMPSON, GEORGE CONKLIN	(21)
VIKUPITZ, EDWARD L.	(22)
WARD, LORRIN LEROY	(26)
WILLIAMS, HERBERT CHILDS	(21)

UNIV. OF TEX.
(B.S. in C.E.)

PIPKIN, WILLIAM KIRK	(24)

(Also Certificate of Meteorology, Univ. of Chicago)

SPRITZER, ABRAHAM	(20)

TULANE UNIV.
(B.E.)

CHAMPION, CLARENCE JOHN, JR.	(20)

VA. POL. INST.
(B.S.C.E.)

BELL, JOHN STEPHEN	(22)

UNIV. OF WASH.
(B.S. in C.E.)

JOHNSON, LAWRENCE EGON	(21)
JONES, MALCOLM STEPHEN, JR.	(21)
JUSTUS, JAMES STANLEY	(22)
MYHRE, STUART HERBERT	(20)
VAREY, EDMUND BERTON	(23)
WILSON, JOHN MELVILLE	(20)

YALE UNIV.
(B.C.E.)

ESSAYAN, EDWARD	(21)

The Board of Direction will consider the applications in this list not less than thirty days after the date of issue.

RECENT BOOKS

New books donated by the publishers and filed in the Engineering Societies Library, or in the Society's Reading Room. Notes regarding books are taken from the books themselves, edited by the staff of the Society or of the Library. Books in the Library may be borrowed by mail by Society members for a small handling charge.

APPLIED ENERGY CONVERSION, a text in Power Plant Engineering. By B. G. A. Skrotzki and W. A. Vopat. McGraw-Hill Book Co., New York and London, 1945. 509 pp., illus., diagrs., charts, tables, 9 × 5¼ in., cloth, $5. The authors of this text in power-plant engineering cover the equipment and economics of industrial and central station power plants, describing the characteristics and performances of the major elements, and discussing the coordination of equipment for the generation of energy from a physical and economic viewpoint. No attempt has been made to present an extensive treatment of structural details or design. The newer developments in gas turbines and wind turbines, as well as special and European types of steam generators are included.

CALCULUS FOR PRACTICAL ENGINEERS IN A SIMPLE, QUICK ENGINEERING WAY. By A. Cibulka. Send orders to Clarke & Courts, Houston, Tex., 1944. 100 pp., illus., diagrs., tables, 12 × 9½ in., paper, $3. The basic equations and functions are given from algebra through trigonometry, analytic geometry, differential and integral calculus to differential equations. The processes of differentiation and integration are described in simple, practical language, with applications to a number of actual and varied engineering problems.

DATA BOOK FOR CIVIL ENGINEERS, DESIGN. By E. E. Seelye. John Wiley & Sons, New York; Chapman and Hall, London, 1945. Diagrs., charts, tables, 12 × 9¼ in., cloth, $7.50. This first volume of a three-volume set presents a considerable amount of effective data necessary for design procedures in the main fields of civil engineering: structures, sanitation, water supply, drainage, roads, airfields, dams, docks, bridges, and soils. The object is to provide a single reference volume for the engineer whose work may spread into fields outside his specialty. The two subsequent volumes will consist of a field manual and a book cost data and model specifications.

ENGINEERING ALLOYS, NAMES, PROPERTIES, USES, 2 ed. By N. E. Woldman and R. J. Metzler. American Society for Metals, Cleveland, Ohio, 1945. 832 pp., tables, 9¼ × 6 in., cloth. Section I of this compilation is an alphabetical list of alloys with corresponding serial numbers. In the more than 400 pages of Section II are given the alloy trade name, composition, properties, uses, and key numbers designating the manufacturers. The alloys are here listed by serial number. Section III is an alphabetical subject index of special characteristics and typical uses. Section IV is a directory of manufacturers with their addresses and a summary of the alloys produced by each. A key index to manufacturers lists them by the designating numbers as used in Section II. A useful data appendix includes also a classification of corrosion and heat-resistant alloys. Some 12,500 entries appear in Section II in the new edition as compared with 8,200 in the first.

LA FATIGUE DES MÉTAUX, 2 ed. By R. Cazaud and L. Persoz, preface by A. Caquot. Dunod, Paris, 1943. 259 pp., illus., diagrs., charts, tables, 10 × 6¼ in., paper, 262 frs. This monograph analyzes the principal studies of the fatigue of metals and presents the results in form for use by engineers and metallurgists. The theories of fatigue in metals, methods of testing, fatigue limits, the factors that affect fatigue, and the resistance of welded and riveted joints are discussed. Bibliographies accompany the several chapters.

SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS, Proceedings, Vol. 3, No. 1. Edited by C. Lipson and W. M. Murray; published and distributed by Addison-Wesley Press, Kendall Square, Cambridge (Mass.), 1945. 154 pp., illus., diagrs., charts, tables, 11¼ × 8½ in. cloth, $5. Twelve articles are included in the current volume, dealing with strain gages, residual stresses, stress models, analysis of shafting and of rivet shear tests, stress analysis with brittle coatings, and stresses in aircraft components. The contents pages of the previous volumes are included at the back. The illustrations in all the volumes are a particularly good feature of the publication.

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MEN AVAILABLE

CIVIL ENGINEER, Jun. ASCE; Navy discharge March 1, 1946; 26; married. Graduate of Carnegie Institute of Technology. Taught civil subjects at Carnegie. Four years' construction engineering: surveying, layout, grading, cost accounting, estimating; on housing projects, highways, railroads, ordnance plant, factory; as party chief, assistant chief engineer, chief estimator. Will work anywhere in the world. C-209.

NAVAL LIEUTENANT in Civil Engineer Corps; Jun. ASCE; B.S. in Sanitary Engineering, 1942; 25; married. Available March 1, 1946. Three years' experience with Naval Construction Battalion in island sanitation and minor construction. Experience data available upon request. Location not important. C-210.

CIVIL ENGINEER; Assoc. M. ASCE; New York professional engineer; 35. With CEC, U.S. Navy; assignments involved design, construction, and maintenance of shore bases. Experienced in subway construction, sanitary design, and engineering administration. Desire position as assistant professor of civil engineering, starting in September 1946, or in education-administration in technical college field. C-211.

PRODUCTION ENGINEER; Jun. ASCE; M.C.E. and B.C.E.; age 29; 2 years' experience in research, construction, and design; and 4 years' production. Desire position in well-established organization in production line layout, methods analysis, planning and scheduling, plant layout, or combination teaching and production consulting. Available February upon discharge as Naval officer. C-212.

ENGINEER; Jun. ASCE; age 34; B.S. in C.E., plus graduate study; as administrative or project engineer; 12 years' broad experience—5 years' administrative and business management and 7 years' engineering. Domestic location preferred; available immediately. C-213.

CIVIL ENGINEER; Jun. ASCE; graduate; Tau Beta Pi; age 30; single; 2 years' experience, including field survey, contractual estimating, and detailing; veteran of World War II with 3½ years Naval experience in petroleum supply and distribution; desires position in construction project development or engineering sales. Location, South or West preferred. C-214.

STRUCTURAL RESEARCH ENGINEER; Jun. ASCE; 28; licensed; 6 years' experience on design of reinforced concrete, steel, timber flood-control structures, including walls, gates, pump stations, multi-story continuous structures. Member of applied mechanics section, aircraft research laboratory; structurally approved all laboratory designs; supervised photoelastic laboratory; applied mathematical background to vibration, fluid-mechanics, stability, elasticity problems. Location, metropolitan area. C-215.

CIVIL ENGINEER; M. ASCE; 38 years' structural experience in steel and concrete; Professional Engineer's License; design and construction; preparation of contracts and specifications; administrative head of large engineering organizations; solicitation of new business; personal negotiations on wide variety of subjects; consulting engineering and contracting. Location in East preferred, but not essential. Available immediately. C-216.

CIVIL ENGINEER; Jun. ASCE; age 31; married; graduate C.E., 1940; 3 years in A.U.S. Corps of Engineers; 2 years' experience in structural drafting and design; 2 years' experience in highway engineering, surveying, and soil and material mechanics. Desire position in structural design or erection fields; foreign country acceptable; available immediately. C-217.

NAVAL OFFICER; Jun. ASCE; age 28; married; expect discharge in 4 or 5 months; graduate of Georgia School of Technology, 1940; 4 years' experience on design, layout, and checking drawings in design office, with emphasis on concrete and reinforced concrete structures, for large hydroelectric development, dams, power houses, spillways, earthwork, etc. Desire similar position in hydroelectric field. C-218.

ESTIMATOR, OFFICE ENGINEER; Assoc. M. ASCE; 39, married, licensed, graduate C.E.; 15 years' experience on tunnels, shafts, dams, field and office, including 3 years on advanced base construction as Navy lieutenant. Desire permanent association with engineer or contractor in New York area offering opportunity to grow with company. Available on reasonable notice. Salary commensurate with responsibility. C-219.

CIVIL ENGINEER; Jun. ASCE; 25; married. Graduate in both engineering and forestry; desires permanent position connected with both professions. One year of experience on government construction projects on layout work for contractors. Would be willing to leave the States. Desires field work with minimum of office work. Available April 1, 1946. C-220.

CIVIL ENGINEER, Jun. ASCE; graduate; 29; experienced in surveying, road construction, steel design, welding design. Especially qualified to handle office procedures, plan work, and prepare correspondence. Desires position in charge of project, office or drawing room. Northern New Jersey preferred. C-221.

COMMANDER, Civil Engineer Corps, U.S. Naval Reserve; Assoc. M. ASCE; 42; married; registered C.E.; 7 years' experience on design and construction of railroads, highway, airdromes, and industrial and waterfront installation; 10 years' experience on design and construction of mining plants, and engineering supervision of underground mining operations. Desire permanent engineer-executive position, Central or Southwestern U.S. preferred. Available May 1, 1946. C-222.

CIVIL ENGINEER; Jun. ASCE; 29; married; B.S. in C.E.; M.S. in C.E.; 2 years in Seabees on construction of airports, roads, and hospitals; 3 years as assistant engineer on construction of Third Locks, Gatun, Canal Zone; 1½ years as instructor, University of Alabama. Desire field position in construction or structural work. Available immediately. Will accept position anywhere. C-223.

CIVIL ENGINEER; Assoc. M. ASCE; 37; master of science; 11 years' teaching experience; surveying, hydraulics, mechanics, fluid mechanics, structural theory, drawing; vacation experience in highway survey and numerous small engineering projects; 42 months' active duty with U.S. Naval Reserve. C-224.

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CONSTRUCTION MACHINERY

STRUCTURAL ENGINEER; Veteran; 25; college graduate; structural engineering; engineering experience; desires position in Wilkes Barre, Pa., or vicinity. Competent and diligent. Also experience in technical and editorial writing. C-225.

PROFESSIONAL ENGINEER; Jun. ASCE; age 32; licensed New York State; M.C.E. (Cornell); lieutenant, U.S.N.R.; 2 years structural design, specializing in reinforced concrete; 5 years as professor of civil engineering and consulting and testing; 2 years Naval officer experience as administrator of research and development of high explosive munitions and explosion phenomena. C-226.

POSITIONS AVAILABLE

STRUCTURAL ENGINEER; civil engineering graduate; as an administrative and executive director, who would be responsible for structural design of steam and electric generating stations. Should have had at least 15 years' experience in actual structural design, with at least 5 of these in supervisory capacity. Salary, $6,000–$7,500 a year. Location, New York, N.Y. W-6322.

CIVIL ENGINEER, young, preferably with some experience in road and highway work for office work in connection with specifications and estimates. Salary, $3,600 a year. Location, northern New Jersey. W-6382.

ENGINEER, 26–32, graduate, with at least 4 years' experience, part of which has included surveying and construction, for a large sugar company. Work consists of designing buildings and small structures, land surveys, irrigation, and general construction. Permanent; good opportunity. Write, stating education, experience, marital status, size of family, and salary expected. Location, Puerto Rico. W-6387.

INSTRUCTOR OR ASSISTANT PROFESSOR OF CIVIL ENGINEERING; young, with B.S. degree and some experience, and preferably with M.S. degree. Salary, $2,600–$2,700 a year, depending upon experience. Location, Ohio. W-6441D.

CIVIL ENGINEER, with some experience, for field and office work on bridges, roads, additions, and remodeling houses and other buildings, etc. Will do some estimating and drafting. Salary, $3,600–$5,000 a year, depending upon experience. Location, Vermont. W-6455.

STRUCTURAL ENGINEER, civil, who is experienced in the preparation of schedules, shop and field details, etc., for industrial buildings. Should be capable of supervising projects in the drawing room. Salary, $5,200 a year. Location, New York, N.Y. W-6458.

INSTRUCTOR OR ASSISTANT PROFESSOR OF CIVIL ENGINEERING; young, with interest in working up to the full responsibility for work in surveying and associated topics. Should have had training and, preferably, experience in application of present-day methods of geodetic surveying and uses of photogrammetry. To start, will teach strength of materials and structures, and establish surveying course. Salary, $3,000–$4,000 a year. Location, New York, N.Y. W-6464.

ASSISTANT ENGINEER, with at least 6 years' experience in railway construction and maintenance work. Work includes surveys, investigations, industrial track layouts, terminal yard layouts, shop layouts, paving, drainage, re-alinement of curves, general design of minor structures and contracts, inspection and supervision of construction. Salary, $3,780 a year. Some traveling, with expenses paid. Headquarters, Florida. W-6483.

CURRENT PERIODICAL LITERATURE

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the article from your own file, from your local library, or direct from the publisher, or they may be borrowed from the Engineering Societies Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

CITY AND REGIONAL PLANNING

AIRPORTS, PLANNING. **Slums Into Airparks.** J. R. Morgan. *Am. City*, vol. 60, no. 10, Oct. 1945, p. 119. Proposal for clearing slum sites and constructing airports; advantages of plan.

FLOORS, CONCRETE. **Reconditioning Concrete Floors.** *Concrete & Constr. Eng.*, vol. 40, no. 10, Oct. 1945, pp. 213–215. Methods of hardening and resurfacing concrete floors subjected to steel-tired traffic in warehouses. From instruction manual of U.S. Army Engrs.

GREAT BRITAIN. **Introduction to Manchester Regional and City Tentative Planning Proposals.** R. Nicholas. *Instn. Mun. & County Engrs., J.*, vol. 72, no. 3, Oct. 2, 1945, pp. 73–78, (discussion) 78–84. Aim, basis and form of proposals submitted, and method of realization discussed.

HOUSING, GREAT BRITAIN. **Influence of Housing Needs on Planning Scheme.** R. L. Stirling. *Surveyor*, vol. 104, no. 2803, Oct. 12, 1945, pp. 605–607. Indicates necessity for close relationship between housing authorities and planning authorities; total allocation of land for housing purposes; estimation of total requirements; effect of possible changes in population; selection of areas for housing development; balance between town and country; village expansion. Before Roy. Sanitary Inst.

LONDON, ENGLAND. **Greater London Plan: Appreciation.** C. W. Craske. *Surveyor*, vol. 104, no. 2801, 2802, Sept. 28, 1945, pp. 565–566, Oct. 5, pp. 581–582. Discussion of parts of report dealing with earlier planning schemes, communications, recreation, and community planning, satellite towns, detailed studies in town planning, and administration.

OAK RIDGE, TENN. **Atom City.** *Arch. Forum*, vol. 83, no. 4, Oct. 1945, pp. 102–116. Planning construction of Manhattan Project town of Oak Ridge, Tenn., providing housing and auxiliary areas, such as restaurants, markets, motion pictures, etc.

ROADS AND STREETS, DESIGN. **City Highways.** A. S. Hamilton. *Instn. Mun. & County Engrs, J.*, vol. 72, no. 3, Oct. 2, 1945, pp. 85–103, (discussion) 104–110. Discussion of research carried out on various aspects of traffic flow as they affect road design.

CONCRETE

AGGREGATES, STANDARDS. **Preformed Expansion Joints for Concrete Pavements.** *Pub. Works*, vol. 75, no. 10, Oct. 1945, p. 38. Revised specifications of A.S.T.M. for preformed expansion joints, including bituminous fiber. Extract from A.S.T.M. Standards on Concrete Aggregates, July 1945.

AGGREGATES, TESTING. **Staining and Pop-Outs in Concrete Masonry.** *Concrete*, vol. 53, no. 10, Oct. 1945, pp. 14–15, 17. Explanation of simple method to detect substances in cinders which may cause staining and popping.

AMMUNITION STORAGE. **Specialist Crews Follow Fast Schedule in Building Flat-Top Powder Magazines.** *Construction Methods*, vol. 27, no. 10, Oct. 1945, pp. 98–99, 158, 160. Illustrations and description of equipment and procedure in building flat-roof reinforced concrete structures 50 by 100 ft in plan, requiring 711 cu yd of concrete per unit, to be used for powder storage at Navy rocket plant near Camden, Ark.

BARGES. **Precast Reinforced Concrete Cargo Barges.** *Concrete & Constr. Engr.*, vol. 40, no. 10, Oct. 1945, pp. 206–211. Description of pre-cast units and construction of barges for British Ministry of Shipping; barge 200 tons dead weight, requires only 18 tons of steel.

CONSTRUCTION. **Concrete Construction in National Forests.** C. A. Betts. *Am. Concrete Inst., J.*, vol. 17, no. 1, Sept. 1945, pp. 1–10. How U.S. Forest Service applied fundamentals of good concrete without elaborate control measures to countless small, isolated jobs in 175,000,000 acres of National Forests and along 100,000 miles of roads serving these areas, with pictures to show some of variety of work done.

CONSTRUCTION. **Job Problems and Practice.** *Am. Concrete Inst., J.*, vol. 17, no. 1, Sept. 1945, pp. 85–90. Notes on following: Non-skid Concrete Surfacing for Wooden Trestles at Mud Mountain Dam (42–168), H. H. Roberts; Exposure of Concrete to High Temperature (42–169); Derrick Stone and Cobbles in Mass Concrete (42–170); Effect of Brine on Concrete (42–171).

DAMS, ARKANSAS. **Form Linings for Concrete Surfaces.** H. V. Pittman. *Eng. News-Rec.*, vol. 135, no. 18, Nov. 1, 1945, pp. 584–588. Fabric-covered 1/16-in. thick, absorptive lining was used for forms at Norfork Dam, at total cost of 12 cents per sq ft; backing absorptive material with non-absorptive lining produced better surfaces at saving of 3½ cents per sq ft over use directly on wood sheathing, which would have required frequent reconditioning; methods of application and actual field experience with both types of lining are given in detail.

HOUSING. **Extra-Rapid Two-Stage Housing.** E. J. Buckton. *Engineer*, vol. 180, no. 4670, July 13, 1945, pp. 32–33. Type of housing proposed provides for ultimate development of permanent housing estates of complete houses; during shortage it is recommended that floor of future upper story should temporarily act as flat roof to ground floor and should be constructed as reinforced concrete slab on reinforced concrete pillars and is referred to as "umbrella." Abstract from fuller statement, entitled "Solving Emergency Housing Problem." See also *Engineering Index*, 1944, p. 511.

PROPERTIES. **Field Use of Cement Containing Vinsol Resin.** C. E. Wuerpel. *Am. Concrete Insti., J.*, vol. 17, no. 1, Sept. 1945, pp. 49–82. Results obtained from 22,398 test specimens manufactured in connection with extensive construction, are presented together with discussion of experience with handling concrete containing over 2,000,000 bbl of Vinsol resin cement during this period in 168 structures; comparisons are drawn between concrete made with plain cement and with cement interground with Vinsol resin as they affect compressive and flexural strength, unit weight and mixing, placing and finishing operations.

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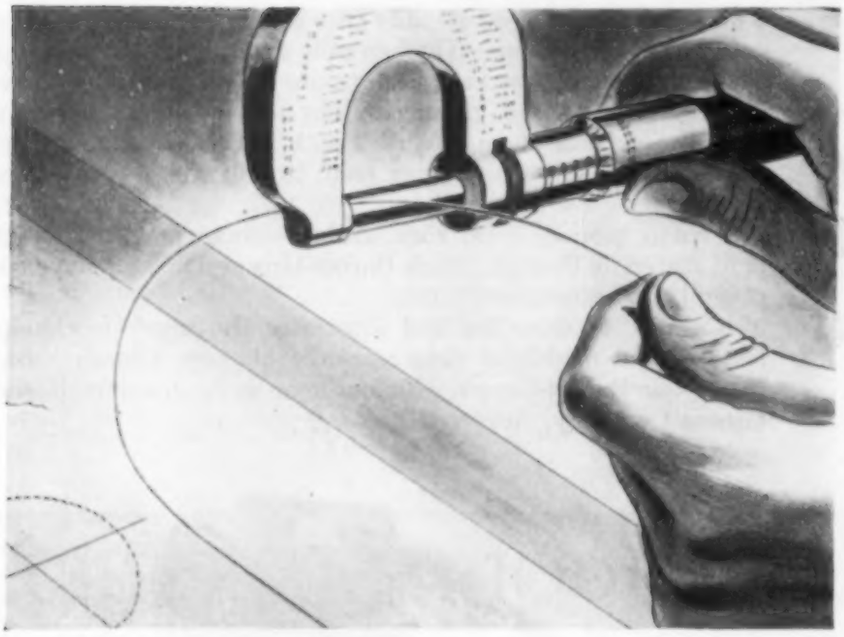

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Waste, W. E. Trauffer. *Pit & Quarry*, vol. 38, no. 4, Oct. 1945, pp. 68–69, 85. New granite crushing and screening plant of J. L. Shiely Co. for production of ballast and commercial aggregates; shovel, haulage, and crusher equipment described.

READY-MIXED PLANTS. Coordinated Transit-Mix Plant Furnishes Large Concrete Volume for Atomic Bomb Project, J. H. Dixey. *Construction Methods*, vol. 27, no. 10, Oct. 1945, pp. 78–80, 152, 154, 156. Description of 2 plants for supplying concrete to project, one plant averaging 225-cu yd per hr and other plant furnishing up to 1,500-cu yd per day.

READY-MIXED PLANTS, SEATTLE, WASH. Kaiser Replaces Two Seattle Batching Plants with New Central-Mixing Plant. *Pit & Quarry*, vol. 38, no. 3, Sept. 1945, pp. 132–133. Description of processes in production at Glacier Sand & Gravel Co. plant; delivery of sand and gravel from scows to mixing plant, which is 6-compartment all-steel plant; mixing operations.

DAMS

EARTH, DESIGN. Soil Mechanics Applied to Dams, R. M. Hardy. *Roads & Bridges*, vol. 83, no. 10, Oct. 1945, pp. 72, 104, 106. Anisotrophy in impervious cores, critical density, and design of filters are considered, as important factors in design of earth dams.

GREAT BRITAIN. King Opens Ladybower Reservoir. *Surveyor*, vol. 104, no. 2801, Sept. 28, 1945, pp. 363–364. Construction of 6,300-million-gal reservoir to supply increased demand to various cities; largest reservoir formed by construction of earthwork embankment in British Isles.

FLOW OF FLUIDS

WATER WELLS, DISCHARGE. Measuring Well Discharge Without Wasting Water, T. H. Sauter. *Pub. Works*, vol. 76, no. 10, Oct. 1945, pp. 18–19. By means of orifice in end of pipe and piezometer tube, water is measured as it discharges into settling basins; measuring and reporting capacity of wells at Cuyahoga Falls, Ohio, by this means has resulted in aiding determination of water table for entire district.

FOUNDATIONS

CRANES. Versatile Machine for Municipalities, L. E. Peck. *Am. City*, vol. 60, no. 10, Oct. 1945, p. 111. Wide variety of jobs performed by truck-mounted crane includes excavating for road widening or rebuilding, loading of sand and gravel, removal and replacement of old stone culverts with concrete pipe, removal of stumps and obstructing rocks, etc.; reasons why machine is more practical than crawler.

PILES, STEEL, DRIVING. Horizontal Pile Hammer. *Construction Methods*, vol. 27, no. 10, Oct. 1945, pp. 82–85, 124, 126, 132, 136. Description of method used, in which hammer, supported in horizontal leads by angle-irons at each side, is pulled forward by cable passing through tackle blocks to niggerhead on derrick boat.

SOIL STABILIZATION. Problem of Devising Tests for Soil Stabilization, L. G. Gabriel. *Inst. Petroleum, J.*, vol. 31, no. 261, Sept. 1945, pp. 353–355, (discussion) 360–361. Brief outline of scope of studies undertaken by Soil Stabilization Panel of Standardization Subcommittee No. 7—Asphaltic Bitumen; procedure adopted was to collect as many as possible of sets of tests already published in different countries, and then to determine origin of any differences.

UNDERPINNING. Factory Underpinned with Three Types of Piles to Prevent Settlement of Walls and Columns, A. Di Giacinto. *Construction Methods*, vol. 27, no. 10, Oct. 1945, pp. 92–94, 168, 170, 172, 174, 176. Description of method used in installing underpinning to prevent further settlement of factory buildings erected on spread footings.

HYDROELECTRIC POWER PLANTS

RIVERS, IMPROVEMENT. Engineering Investigation of Water Resources of Columbia River Basin, V. Meek. *Eng. J.*, vol. 28, no. 8, Sept. 1945, pp. 584, 585. Large-scale investigations have been undertaken and are planned for development of basin; description of area; agreement between United States and Canada.

HYDROLOGY AND METEOROLOGY

HYDROLOGY. Section of Hydrology. *American Geophysical Union, Trans.*, vol. 26, no. 2, Oct. 1945, pp. 261–298. Application of Statistical Theory to Velocity and Suspended Sediment Measurements in Rivers, A. A. Kalinske; Note on Multiple Rain-Gages, H. G. Fourcade; Prevention of Seepage in Foundations for Dams, R. T. Sill and D. M. Baker; Forecasting Stream-Flow of Salt River, Arizona, C. K. Cooperrider, H. O. Cassidy, and C. H. Niederhof. Accounting of Daily Accretion, Depletion, and Storage of Soil-Water as Determined by Weighing Monolith Lysimeters, L. L. Harrold and F. R. Dreibelbis; Obtaining Large Undisturbed Soil-Cores in Metal and Transparent Cylinders (Abstract), W. E. Goode and J. E. Christiansen.

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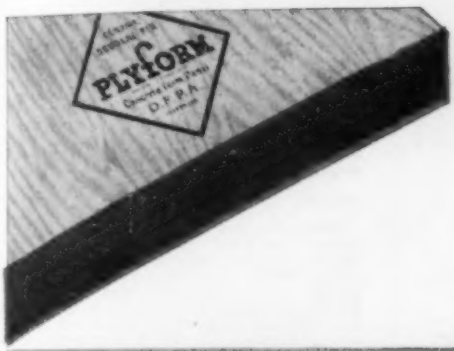

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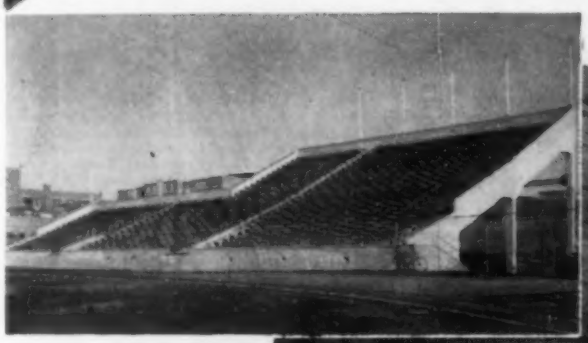

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Right: A close-up of the PLYFORM forms in the bleacher section, before stripping.

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MANAGEMENT. Determining Trend of Range-Watershed Condition Essential to Success in Management, R. W. Bailey. *J. Forestry*, vol. 43, no. 10, Oct. 1945, pp. 733–737. Accurate determination of condition and trend of plant cover and soil mantle considered key to satisfactory range-watershed management; many unsatisfactory range-watershed situations are attributed to inadequate understanding of conditions and trend; further research in ecology and soils, fuller use of range condition and trend in surveys and inspection, and higher professional qualifications for range-watershed managers, advocated.

SEISMOLOGY. Section of Seismology. *American Geophysical Union, Trans.*, vol. 26, no. 2, Oct. 1945, pp. 201–203, 313–316. Papers: Earthquakes, Atmospheric Pressure, Geologic Structure (Abstract), V. Conrad; Influence of Reservoir-Loading Earthquake Activity in Boulder Dam Area (Abstract), D. S. Carter. Progress-Reports: Earthquake Study in Southern California, 1944, B. Gutenberg and C. F. Richter; Progress-Report of Jesuit Seismological Association for 1944, J. B. Macelwane.

INLAND WATERWAYS

MILITARY ENGINEERING. Rhine River Flood Prediction Service, S. W. Dziuban. *Military Engr.*, vol. 37, no. 239, Sept. 1945, pp. 348–353. Establishment and operation of flood prediction service to provide Army Engineers with constant flow of data, including short-range river stage predictions and longer-range forecast of trend of river level.

IRRIGATION

PALESTINE. Future Development of Palestine, C. Q. Henriques. *Engineering*, vol. 160, no. 4151, Aug. 3, 1945, pp. 83–84. Discussion of recent publication "Palestine, Land of Promise," by W. C. Lowdermilk; book bases its proposals on efficiency which, it claims, is obtainable by organization along lines laid down for Tennessee Valley Authority; in writer's opinion, there are more possibilities in agricultural development of Negreb than in all rest of Palestine put together; see also correspondence item, by H. Addison, in no. 4153, Aug. 17, p. 135.

LAND RECLAMATION AND DRAINAGE

CULVERTS. Probable Life of Corrugated Culverts, G. E. Shafer and W. J. Kroff. *Eng. News-Rec.*, vol. 135, no. 16, Oct. 18, 1945, pp. 504–508. Survey of performance of more than 800 large corrugated iron plate pipes and arches serving as culverts indicates life expectancy for pipes of at least 50 years while for arches there was not sufficient measurable deterioration on which to base prediction; other survey results are of value in determining how to use corrugated pipes and arches more effectively as drainage structures.

RAILROAD TRACKS, DRAINAGE. Case Histories of 2 Subdrainage Jobs. *Highway Mag.*, vol. 36, July–Aug. 1945, pp. 87–90. Report on stabilization of ground conditions on double track of C.St.P.M. & O. (Omaha) Railroad by drainage through 10-in. perforated corrugated pipe installed in track ditch, parallel to and about 6 ft below rail; connected at right angles to this drain, on about 50-ft centers, 8-in. perforated lateral drains were placed under track.

MATERIALS TESTING

CONCRETE BEAMS AND GIRDERS. Compression Tests on Beams, C. H. Diggory. *Concrete & Constr. Eng.*, vol. 40, no. 10, Oct. 1945, pp. 202–205. Report on series of site tests using Continental method of testing reinforced concrete beams at same time making comparative laboratory tests with 6-in. cubes.

CONCRETE REINFORCEMENT. Lapped Bar Splices in Concrete Beams, R. W. Kluge and E. C. Tuma. *Am. Concrete Inst., J.*, vol. 17, no. 1, Sept. 1945, pp. 13–33. Investigation was conducted to determine general behavior and strength of lapped bar splices which varied in length and method of splicing; maximum bond resistance developed in splice and slip of bar was determined for two types and sizes of reinforcement.

PORTS AND MARITIME STRUCTURES

BREAKWATERS. Building Port Apra Breakwater, R. P. Day. *Eng. News-Rec.*, vol. 135, no. 16, Oct. 18, 1945, pp. 496–501. Heavy storms at Guam moved aside concrete barges sunk as temporary harbor protection and dictated use of armor rock facing ranging up to 30 tons in weight; fill, composed of quarry rock rated as "coral limestone," required 1.5 to 2 lb of powder per cu yd for blasting.

CAUSEWAYS. Orkney Causeway. *Engineer*, vol. 180, no. 4670, July 13, 1945, pp. 28–31. Islands are tied up to mainland by series of causeways nearly mile and half long and over 16 ft wide; work was undertaken to improve anchorage at Scapa Flow; 650,000 tons of rock were quarried and conveyed to causeway site; 325,000 tons of 5-ton and 10-ton concrete blocks were dumped at random to protect exposed faces of work; 3½ miles of permanent new roads were built across islands.

SHORE PROTECTION. Sea Defences of Romney and Denge Marshes, G. C. Crowther. *Surveyor*, vol. 104, no. 2900, Sept. 21, 1945, p. 557. Author claims that former schemes were not built on sound engineering principles; wall design must not make it dependent on shingle bank for support; tidal outfalls. Summary of paper before Instn. Mun. & County Engrs.

ROADS AND STREETS

AIRPORT RUNWAYS, MAINTENANCE AND REPAIR. Airfield Pavement Maintenance. *Roads & Streets*, vol. 88, no. 10, Oct. 1945, pp. 78–87. Summary of methods developed and used by Army Engineers in upkeep of 175 fields; maintenance methods for flexible pavements and for concrete pavements described.

ASPHALT. Design Data for Various Types of Asphalt Wearing Surfaces, N. W. McLeod. *Roads & Bridges*, vol. 83, no. 10, Oct. 1945, pp. 73–76, 106, 108, 110, 112. Properties and use of liquid asphalts and asphalt cements discussed; types of asphalt pavements classified in terms of composition and costs; outline of design of more important pavement types.

COLORADO. Colorado Inventories Road Needs. *Better Roads*, vol. 15, no. 10, Oct. 1945, pp. 33–34, 36. Concurrent with appraisal of highway needs, Colorado State Highway Department is recommending overhauling of tax laws to secure adequate financial base; increase of 2 cents in gasoline tax asked, along with restoration of transfers and heavier truck taxes.

DESIGN. Planning for City Highway Traffic. J. L. Gubbels. *Better Roads*, vol. 15, no. 10, Oct. 1945, pp. 29–30. Preliminary urban planning of Texas Highway Dept. described.

HEATING SIDEWALKS. Snow Free Surfaces Outside Buildings, E. A. Dench. *Constructor*, vol. 27, no. 10, Oct. 1945, pp. 31–33. Description of several pipe installations under concrete slab, so that continuous melting of snow takes place as it falls.

HIGHWAY LIGHTING COSTS. Study of Highway Lighting Costs, D. W. Rowten. *Am. City*, vol.

HERE'S HOW ENGINEERS "Outlawed" PAVEMENT BREAKUPS

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60, no. 10, Oct. 1945, pp. 143, 145. Comparison of incandescent, sodium, and mercury vapor source as to cost.

HIGHWAY SYSTEMS, CHINA-BURMA-INDIA. Ledo-Burma Road. *Engineering*, vol. 160, no. 4158, Sept. 21, 1945, pp. 221–224 (illus.) p. 230. Illustrated description of road 420 miles long, of which 270 miles were in virgin jungle, and 102 miles in mountain section, built in 15 months by American troops; road connects Ledo in Assam with two points in original Burma Road.

HIGHWAY SYSTEMS, GREAT BRITAIN. Britain Plans Her Post-War Highways. *Highway Mag.*, vol. 36, Sept.–Oct. 1945, pp. 104–106. Need for broadening existing main roads and constructing new network of motor trunk roads; plan proposed by County Surveyors' Soc. Condensation of article from *Neptune*, date not specified.

HIGHWAY SYSTEMS, STANDARDS. A.A.S.H.O Standards Covering 1944 Road Act. *Concrete*, vol. 53, no. 10, Oct. 1945, pp. 7–8. Design standards adopted by Am. Assn. State Highway Officials for national system of interregional highways.

MACHINERY. Connecticut Develops Mower-Rake. *Better Roads*, vol. 15, no. 10, Oct. 1945, pp. 58, 60. Combination unit trims roadsides and gathers cuttings in single operation; rake works with full efficiency under any conditions that permit mower to be used.

MAINTENANCE AND REPAIR. Knoxville Resurfaces with Topeka Mix, B. C. Baker and L. C. Bailey. *Roads & Streets*, vol. 88, no. 10, Oct. 1945, pp. 65–67. Severely deteriorated streets are patched and given 2-course resurfacing of hot bituminous plant-mix, surface course being Topeka mix; less worn sections given mat treatment.

MAINTENANCE AND REPAIR. Planning a County's Road Future, E. J. Allmendinger. *Better Roads*, vol. 15, no. 10, Oct. 1945, pp. 31–32, 42, 44. Major objectives in Washtenaw County, Mich., for 3 to 5 years ahead are black-topping of gravel roads and bridge replacement; review outlook uncertain.

MAINTENANCE AND REPAIR. So You're Planning to Get Out a Maintenance Manual! E. I. Worthington. *Better Roads*, vol. 15, no. 10, Oct. 1945, pp. 26–28. Problems confronted by West Virginia State Road Commission in issuing highway maintenance manual are reviewed and procedure followed is described.

SNOW AND ICE CONTROL. Highway Snow Removal Methods. *Eng. News.-Rec.*, vol. 135, no. 18, Nov. 1, 1945, pp. 589–600. Brief descriptions of current practices by twelve state highway departments are presented.

SNOW AND ICE CONTROL. Poor Road Conditions Boost Snow Removal Costs, E. J. Mattis. *Roads & Streets*, vol. 88, no. 10, Oct. 1945, pp. 100, 113. Roads should be improved in order to carry out snow removal operations economically.

SNOW AND ICE CONTROL. Pre-Winter Snow Removal Plans, C. D. Warner. *Am. City*, vol. 60, no. 10, Oct. 1945, pp. 103–104. Brief description of procedure used in Detroit, Mich., for handling snow and ice removal; bulletin listing specific jobs is distributed to foremen; heavy use of rock salt.

SOIL CEMENT. Soil-Cement: Typical "Specs." *Roads & Streets*, vol. 88, no. 10, Oct. 1945, pp. 89–90, 92, 94–95. Standard specifications of Alabama State Highway Dept. relating to soil-cement base course.

SANITARY ENGINEERING

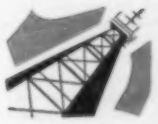
BRITISH COLUMBIA. Public Health Engineering in British Columbia, R. Bowering. *Water & Sewage*, vol. 83, no. 10, Oct. 1945, pp. 42, 44, 46. Highlights of more recent activities of provincial board of health; water supplies; sewage disposal; cannery sanitation; sanitary complaints.

SEWERAGE AND SEWAGE DISPOSAL

INDUSTRIAL WASTES. Whither Industrial Waste Treatment? R. D. Hoak. *Sewage Works Eng. & Mun. Sanitation*, vol. 16, no. 10, Oct. 1945, pp. 494–495. Industries study recovery and treatment methods; industrial waste treatment more complex than sewage; utilization of purifying power of streams to aid in problem.

INDUSTRIAL WASTES, BIOLOGICAL TREATMENT. Biological Treatment of Soluble Organic Wastes, W. Rudolfs. *Sewage Works Eng. & Mun. Sanitation*, vol. 16, no. 10, Oct. 1945, pp. 501–502. Discusses soluble wastes that are not feasible to handle by physical or chemical means and proves that they can be purified by biological means; indicates that biological methods need modification for this method.

INDUSTRIAL WASTES, CANNERIES. Freezing as Factor in Stabilization of Corn Cannery Wastes, P. W. Riedesel and W. R. Lawson. *Sewage Works J.*, vol. 17, no. 5, Sept. 1945, pp. 952–965. Account of experiments to determine effect of freezing in stabilization of corn cannery wastes; conclusions as to construction and operation of lagoons.



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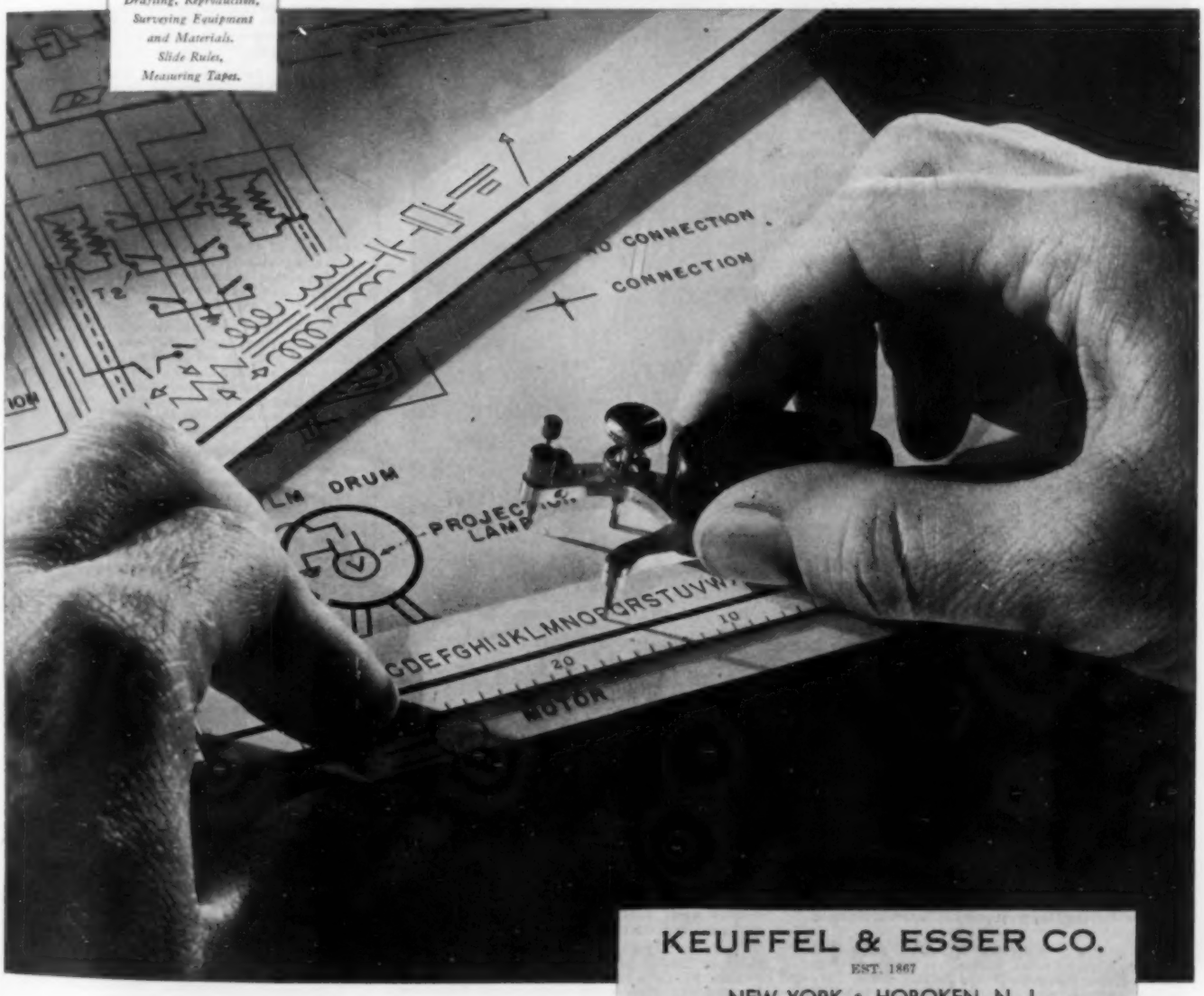

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INDUSTRIAL WASTES, PAPER AND PULP MILLS. Trends in Handling Pulp and Paper Mill Waste, H. W. Gehm. *Sewage Works Eng. & Mun. Sanitation*, vol. 16, no. 10, Oct. 1945, pp. 496–497, 528. Attack on paper wastes pollution divided into recovery of usable materials, treatment of wastes before discharge, and improvement of stream waters to increase ability to accept wastes.

INDUSTRIAL WASTES, PICKLING PLANTS. Treatment and Disposal of Spent Pickling Liquors, R. D. Hoak. *Sewage Works J.*, vol. 17, no. 5, Sept. 1945, pp. 940–951. Brief review of many processes offered for waste pickle-liquor treatment. Bibliography.

INDUSTRIAL WASTES, WOOL PROCESSING. Sulfide Wool Wastes Endanger Sewer System, A. M. Rawn. *Sewage Works Eng. & Mun. Sanitation*, vol. 16, no. 10, Oct. 1945, pp. 491–493. Effect of sulfides from wool pulling process was overcome by recovery of part of sodium sulfide and treatment of remainder with ferrous sulfate.

REFUSE DISPOSAL, DIGESTION. Treatment Would Cost 55 Cents per Household Grinder, G. J. Schroepfer. *Sewage Works Eng. & Mun. Sanitation*, vol. 16, no. 10, Oct. 1945, pp. 498–500. Investigation to show effect of addition of ground garbage to sewers on operation of plant; stimulation in use of household garbage grinders investigated.

SEWAGE TANKS. Single-Residence Septic Tanks, A. C. Peterson. *Water & Sewage*, vol. 83, no. 10, Oct. 1945, pp. 24–26, 46, and 48. Proper design and construction of residential sewage treatment plants require care to ensure successful operation and to avoid pollution to nearby well; grease trap; house sewer; design and construction of tank; concrete construction.

SEWAGE TANKS, DESIGN. Designing Sewage Settling Tanks, M. B. Tark. *Pub. Works*, vol. 76, no. 10, Oct. 1945, pp. 15–17, 46, 48, 50, 52, 54, and 56. How to fix capacity and dimensions of primary tank, and of secondary tanks for filter and activated sludge effluents; details of structures for distributing flow among several tanks.

SEWAGE TREATMENT, ACTIVATED SLUDGE. "Economized" Activated Sludge Tests Are Promising, U. T. Mann. *Sewage Works Eng. & Mun. Sanitation*, vol. 16, no. 10, Oct. 1945, pp. 513–517. Results of preliminary studies at Syracuse, N.Y., plant on effect of reduced detention time, air consumption, and mixed liquor concentrations.

SEWAGE TREATMENT PLANTS, DETROIT, MICH. Sewage Treatment at Detroit. *Water & Sewage*, vol. 83, no. 10, Oct. 1945, pp. 28–29, 54, 56–58, and 60. Description of sewage plant; pumping station holds 8 vertical centrifugal pumps with total capacity of 2,000 cu ft per sec; racks, grit chambers, sedimentation tanks, sludge collectors, method of effluent discharge, sludge digestion tank of 300,000-cu ft capacity, incineration equipment, electrical equipment, chlorinators, plant control, and explosion hazards described.

SEWAGE TREATMENT PLANTS, FLY CONTROL. Swat That Fly, G. E. Symons. *Water Works & Sewerage*, vol. 92, no. 9, Sept. 1945, pp. 289–290. Methods of eliminating flies at sewage plants are described; available types of electric fly traps are discussed, and notes are given on successful applications.

SEWAGE TREATMENT PLANTS, GREAT BRITAIN. Darlington Sewage Works and Farm, W. Oliver. *Surveyor*, vol. 104, no. 2801, Sept. 28, 1945, pp. 567–568. Sewage discharged by means of culvert 5 ft × 3 ft 4 in. to sewage farm; experimental activated sludge plant for biofiltration process; low-level works completed in 1941; sludge storage and digestion. Before Inst. Sewage Purification.

SEWAGE TREATMENT PLANTS, ONTARIO. Construction Progress on Toronto Sewage-Treatment Plant. *Water & Sewage*, vol. 83, no. 10, Oct. 1945, pp. 15–20, 62, and 64. Sea wall has been completed, also portions of six sedimentation tanks; over 9,000 piles driven for foundations for structures; labor and material shortages have retarded progress.

SEWERS, CONSTRUCTION. Laying and Jointing Sewer Pipes, F. C. Palmer. *Water Works & Sewerage*, vol. 92, no. 9, Sept. 1945, pp. 286–288. Discussion of problem of root-proof and leak-proof joint; types of joints; bitumen jointing compound; procedure in laying and jointing; recommended joint.

SEWERS, INFILTRATION. Useful Technic in Ground Water Infiltration Studies, C. A. McLoughlin. *Sewage Works J.*, vol. 17, no. 5, Sept. 1945, pp. 924–928. Account of methods used in determining amount of infiltration in Connecticut town.

STRUCTURAL ENGINEERING

BEAMS AND GIRDERS, CONTINUOUS. Continuous Beams of Unequal Spans and Variable Moments of Inertia, A. Sanyal. *Concrete & Constr. Eng.*, vol. 40, no. 10, Oct. 1945, pp. 197–201. Analysis of continuous beams can be made by balancing either changes of slope or deflections at supports; if moment distribution method is applied, fixed end moments, stiffness, and carry-over factors need to be determined for each span.

BEAMS AND GIRDERS, STRESSES. On Dynamics of Elastic Buckling, J. H. Meier. *J. Aeronautical Sciences*, vol. 12, no. 4, Oct. 1945, pp. 433–440. Time-deflection relations are investigated when axial force is rapidly applied to nearly straight bar; distinction is made between two cases; in first, force applied is smaller than Euler's load for elastic buckling; in second, it is greater.

BUILDING MATERIALS, ALUMINUM ALLOYS. How and When to Use Aluminum Alloys, R. L. Moore. *Eng. News-Rec.*, vol. 135, no. 16, Oct. 18, 1945, pp. 518–524. Light weight, combined with high strength, pleasing appearance, corrosion resistance, and availability in wide variety of forms are properties that should make aluminum alloys attractive to structural engineers of postwar period; efficient design requires knowledge not only of mechanical properties of various alloys, but also of behavior of basic types of structural members; correlations of theory with experiments have led to formulation of rules to assist in design.

STRESSES. Extension of Beam Theory to Tapered Beams and Conical Shells, L. Beskin. *J. Applied Physics*, vol. 16, no. 9, Sept. 1945, pp. 511–528. Extension of theory made to determine exact normal and shear stress distributions in special cases of tapered plane beams of constant thickness and conical shells.

WOODEN CONSTRUCTION. Wartime Innovations in Timber Design, A. G. H. Dietz. *Eng. News-Rec.*, vol. 135, no. 16, Oct. 18, 1945, pp. 514–517. Increased allowable unit stresses used for wartime timber construction and now recommended for peacetime use are based on use of stress graded lumber and assume loads to be permanent; provision is made for variations in those stresses for combinations of temporary and permanent loads; laminated timbers are permitted higher unit stresses than solid, and in design of composite beams usual flexural formulas are modified by introduction of form factors.

SURVEYING

REGIONAL PLANNING. Surveys and Maps in State Planning, E. M. Herlihy. *Surveying & Mapping*, vol. 5, no. 1, Jan. 1945, pp. 38–44. Need for necessary sub-surface, surface, and aerial surveys in planning work on federal, state, and local levels; historical review of survey work in

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Massachusetts; discussion of soil surveys, land use maps, and water resources planning.

WATER PIPE LINES

CYLINDERS, MEASUREMENT. Surface Area of Cylindrical Objects, W. F. Schaphorst. *Water Works & Sewage*, vol. 92, no. 10, Oct. 1945, p. 305. Chart calculates surface area of cylinder, given diameter and length, and vice versa; may be applied to tanks; pipe lines, drums, conduits, poles, stakes, standpipes, etc.

IDENTIFICATION. Identification of Piping Systems, W. W. Schnarr. *Can. Min. J.*, vol. 66, no. 9, Sept. 1945, pp. 620–622. Pipe identification color code as adopted by Noranda Mines; main pipe classifications are air, steam, and water; as yet, no colors have been assigned to mill solutions and reagents; system is based chiefly on requirements outlined by Am. Standards Assn.

METALS CORROSION, INHIBITORS. Scale and Corrosion Control in Potable Water Supplies at Army Posts, R. T. Hanlon, A. J. Steffen, G. A. Rohlich and L. H. Kessler. *Indus. & Eng. Chem.*, vol. 37, no. 8, Aug. 1945, pp. 724–735. Progress report on series of tests carried out to determine effectiveness of various chemicals in preventing scale and corrosion, under controlled conditions, control of scale can be accomplished economically by threshold conditioning; correction of corrosion difficulties, although not so pronounced as control of scale-forming waters, has been accomplished by chemical conditioning.

WATER POLLUTION. Pollution Hazards in Water Supply System, L. P. Cabana. *Eng. J.*, vol. 28, no. 9, Sept. 1945, pp. 576–580. Report on experiences in Montreal, Canada, dealing with water pollution within buildings; possible sources of pollution are danger of delivered water being polluted, danger caused by cross connections between city water and auxiliary source, and faulty plumbing; pollution sources and remedies are discussed.

WATER RESOURCES

MILITARY ENGINEERING. Army-Developed Water Supplies on Middle Pacific Islands. *Water Works Eng.*, vol. 98, no. 22, Oct. 31, 1945, pp. 1250–1252. Unusual conditions encountered in developing water supply; much study preceded planning; computing height of fresh water table; permeability of water-bearing formations; locating wells on coral and sand islands; water on Iwo-Jima at 180 F.

OIL FIELDS, WATER PROBLEMS. Application of Oil Field Water Studies to Geology and Production, L. C. Case. *Oil Weekly*, vol. 119, no. 9, Oct. 29, 1945, pp. 48–50, 52. Outline of theories as to possible effects of oil, during its formation and entrapment, on water with which it came in contact; water analysis and calculation; interpretation; specific application of water analysis to production problems; well completion; water flooding and salt water disposal; geological significance of oil field waters; specific applications. Bibliography.

WATER LAW. Law of Riparian Rights, L. T. Parker. *Water Works Eng.*, vol. 98, no. 20, Oct. 3, 1945, pp. 1150, 1164, and 1166. Discussion of various court decisions in reference to riparian rights.

WATER TREATMENT

COAGULATION. Coagulation Basins Improve Reduction of Turbidity, J. C. Detweiler. *Am. City*, vol. 60, no. 10, Oct. 1945, pp. 105–106. Illustrated description of two mixing basins installed on both primary and secondary coagulation processes at Omaha, Nebr., plant.

INDUSTRIAL. Water Softening. *Iron & Steel*, vol. 18, no. 12, Nov. 1945, pp. 509–510. Description of new lime and soda-ash softening plant, known as accelator, which greatly increases precipitation of calcium carbonate and magnesium hydrate sludge; principle of plant consists in coagulant action and mixing very thoroughly by motor-driven agitator; construction and operating details and working results explained.

INSECT CONTROL. Control and Elimination of Pest Infestations in Public Water Supplies, M. E. Flentje. *Am. Water Works Assn.—J.*, vol. 37, no. 11, Nov. 1945, pp. 1194–1203. Review of problems of controlling various kinds of pests and report on use of DDT and other control measures that have proved successful and practical.

IRON REMOVAL. Problems with Iron in Deep Well Supplies, E. M. Grime. *Am. Water Works Assn.—J.*, vol. 37, no. 11, Nov. 1945, pp. 1173–1178. Problems of iron removal in three typical wells.

SEAWATER, SALT REMOVAL. Drinking Water from Sea Water by Chemical Method, E. I. Akeroyd, E. L. Holmes, and A. Klein. *Water & Water Eng.*, vol. 48, no. 594, Oct. 1945, pp. 556–560. Development of apparatus, with reagent consisting of mixed barium silver zeolite containing precipitated silver oxide together with disrupter; briquettes contain activated carbon to produce clear water; apparatus described for use of aviators forced down at sea.

TASTE AND ODOR CONTROL. Activated-Carbon System at Milwaukee, J. E. Kerslake. *Water &*

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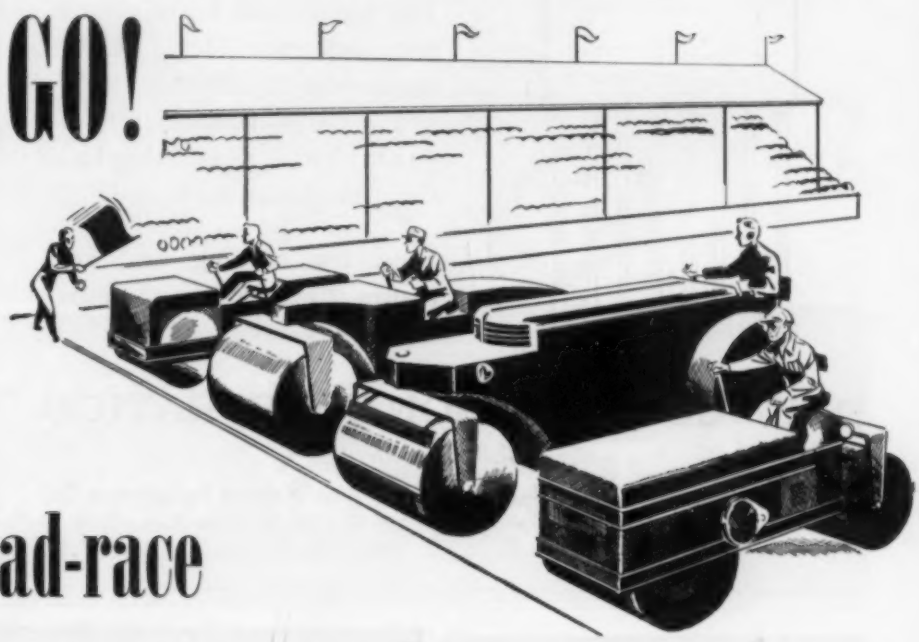

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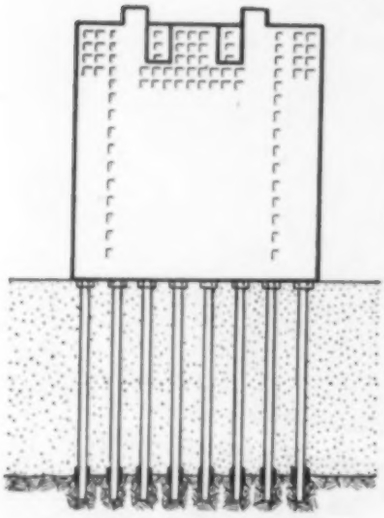

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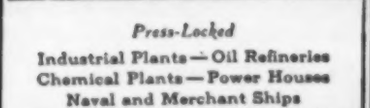

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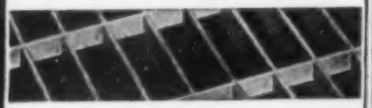

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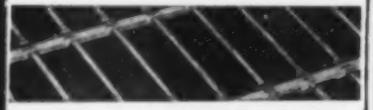

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Sewage, vol. 83, no. 10, Oct. 1945, pp. 72-73, and 77. Threshold odor tests run every 2 hours to determine need for carbon; chemical feed equipment and method of feeding described. From *Taste and Odor Control J.*, date not specified.

TASTE AND ODOR CONTROL. Taste Is Better Now, F. B. Bridges. *Am. City*, vol. 60, no. 10, Oct. 1945, pp. 117–118. Description of improvements in process for producing more palatable water at Monroe City, Mo., plant; new aerator was installed, sedimentation-flocculation unit was reconstructed, and new storage facilities added for chemicals, coal, and other supplies.

WATER ANALYSIS. Sleuthing in Water Works Chemical Laboratory, E. J. Lynde and F. R. Marks. *Am. Water Works Assn.—J.*, vol. 37, no. 11, Nov. 1945, pp. 1144–1150. Systematic testing policy of Pasadena, Calif., Water Dept.; problems confronted by laboratory illustrated by several examples.

WATER ANALYSIS, CHLORINE DETERMINATION. Direct Reading Arsenite-Orthotolidine Test, A. A. Hirsch. *Water & Sewage Works*, vol. 93, no. 9, Sept. 1945, pp. 277–279. Various proposals are made that sodium arsenite solution be mildly acidified and concentration of sodium arsenite be doubled to reduce dilution error, and that test be used to yield direct readings for free chlorine, total chlorine, and interferences in single set of determinations.

WATER SOFTENING, MATERIALS. Synthetic Ion-Exchange Resins, W. C. Bauman. *Am. Water Works Assn.—J.*, vol. 37, no. 11, Nov. 1945, pp. 1211–1215. General nature of ion-exchange substances discussed, properties of synthetic ion-exchange resins studied, and application to treatment of fresh water supplies reviewed.

WATER SOFTENING, THRESHOLD TREATMENT. Corrosion Control with Threshold Treatment, G. B. Hatch and O. Rice. *Indus. & Eng. Chem.*, vol. 37, no. 8, Aug. 1945, pp. 752–759. Rate of formation of protective films upon metal surfaces in threshold-treated waters is function of rate of supply of glassy phosphate to these surfaces and is dependent upon type and velocity of flow, as illustrated by data from continuous flow tests; by means of batch tests effects of intermittent motion, temperature, couples, and inhibiter reactions upon inhibitive action of glassy phosphate were determined. Bibliography.

WATER SOFTENING, THRESHOLD PROCESS. Threshold Treatment of Water Systems, G. B. Hatch and O. Rice. *Indus. & Eng. Chem.*, vol. 37, no. 8, Aug. 1945, pp. 710–715. Corrosion control and scale prevention with glassy phosphate; typical applications indicating control of calcium carbonate scale, dissolved iron, and corrosion are discussed.

WATER WORKS ENGINEERING

BRONZE. Copper Base Alloys for Longer City Equipment Life. *Am. City*, vol. 60, no. 10, Oct. 1945, pp. 121 and 125. Properties of aluminum and silicon bronzes suitable for use in water works and sewage plants, manufactured by Bridgeport Brass Co. under trade name Duronze.

CHICAGO, ILL. North Chicago Doubles Its Water Supply Facilities, C. Hebior. *Water & Sewage Works*, vol. 92, no. 9, Sept. 1945, pp. 265–267. Construction of new intake line of cast-iron mechanical-joint pipe, filter plant improvements, installation of new chemical-feed equipment, and construction of 1,000,000-gal concrete reservoir described.

ELECTRIC MOTORS, PROTECTION. Protection of Motors and Controls Against Moisture, H. V. Crawford. *Water & Sewage Works*, vol. 92, no. 9, Sept. 1945, pp. 268–270. Description of system used for moisture protection of motors used in water works and sewage plants; what constitutes effective protection against moisture; automatic heat drying of motor windings; cost of system and operation.

EMPLOYEES, REHABILITATION. Re-employment of Servicemen. *Am. Water Works Assn.—J.*, vol. 37, no. 10, Oct. 1945, pp. 1021–1030. Suggestions to water utilities on re-employment of veterans.

EQUIPMENT. Alexandria, Virginia—Survival and Retirement Experiences with Water Works Facilities. *Am. Water Works Assn.—J.*, vol. 37, no. 10, Oct. 1945, pp. 1054–1068. Tables list year of installation, number of feet of mains installed, number still in service, and number retired, installation of valves, number in service, and number retired.

EQUIPMENT. Clyde, New York—Survival and Retirement Experience with Water Works Facilities. *Am. Water Works Assn.—J.*, vol. 37, no. 11, Nov. 1945, pp. 1216–1224. Summary of installations and retirements of mains, valves, hydrants, and services.

EQUIPMENT. Huntington, West Virginia—Survival and Retirement Experience with Water Works Facilities. *Am. Water Works Assn.—J.*, vol. 37, no. 11, Nov. 1945, pp. 1225–1238. Summary of installations and retirements of mains.

EQUIPMENT. Operation and Maintenance of Plant Equipment, C. M. Hoskinson. *Am. Water Works Assn.—J.*, vol. 37, no. 11, Nov. 1945, pp. 1151–1158. Problems of friction, lubrication, corrosion, electrolytic action, and breakdown in dielectric strength discussed.

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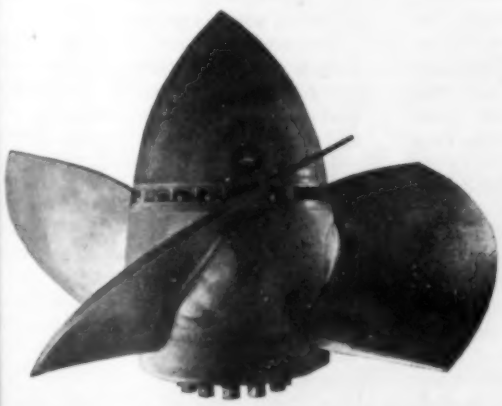

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and closing discharge door, retains heat in winter and protects the concrete from bad weather at all times. With the "Slow" drum speed provided by Jaeger's exclusive 2-speed transmission, it maintains the pre-determined slump of the material on long-haul deliveries. Lighter weight, lower center of gravity, and ease of cleaning and maintenance are further advantages of the top-loading type.

Jaeger also offers end-loading units with a gated hopper which remains sealed to the drum at all times, permitting use of light-pressure rubber seal with built-in pressure lubrication. Both top- and end-loading types offer such improvements as water tank mounted low on the main frame, high-pressure water pump and clog-proof water jet, positively aligned transmission, center drive to internal drum gear, and enclosed front end providing weather protection and winter warmth for engine, transmission, water system, and drum.

Philadelphia Gear Representatives

PHILADELPHIA GEAR WORKS INC., of Philadelphia, recently made the following appointments: Leroy L. Handy, 6932 Cass Ave., Detroit 2, Mich., who will represent the Detroit area on all products, including Limitorque Valve Controls, for them.

Atwood Machinery Company, 931 Santa Fe Ave., Los Angeles 21, Calif., who will represent them in Southern California on everything except Limitorque Valve Controls.

Chicago Bridge and Iron Co. Reopens Detroit Office

THE CHICAGO BRIDGE and Iron Company reopened their Sales Office in Detroit, Mich., on January 1, 1946. It is located in the Lafayette Building. Edward D. Barrett, formerly of their Chicago Office, is in charge of the Detroit Office.

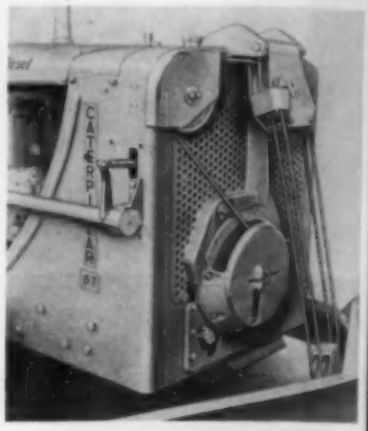
New Bucyrus-Erie Excavator

A NEW 1½-yd model 38-B fully convertible excavator is announced by Bucyrus-Erie Company, South Milwaukee, Wis. Showing a remarkably fast operating cycle in months of thorough field testing, the new unit has demonstrated continuous record-breaking output for users. In a recent extensive field test, a new Bucyrus-Erie 38-B shovel matched the cycle speed of a much smaller machine. This performance of the larger machine has been attained by careful synchronization of speed and power of the various functions and excellent distribution of weight. Big responsive clutches and brakes with direct control give the operator accurate "feel" and ease of operation.

Constructed for equal effectiveness as a shovel, dragline, crane or clamshell, the new 38-B offers a number of operating refinements. As a dragline, the 38-B has big working ranges with a new mast-type suspension available for long booms. Full rotating fairlead, selection of wide, long and tapered end crawler mountings for ample bearing area, and superior performance in soft going are other dragline features. Advantages of the new 38-B shovel include a strong but light boom with large diameter point sheaves for effective application of digging force, independent positive twin rope crowd and high lip all-welded dipper for fast filling and dumping in rock or dirt. As a crane, the 38-B offers long booms with optional jib extensions, two-clutch-operated independent boom hoist with full, accurate power control of raising and lowering, and optional independent two speed propel.

New Cable Control Unit

PRODUCTION OF A NEW single-drum, front-mounted cable control embodying the smooth performing multiple disk type clutch which has been a feature of "Caterpillar" track-type tractors for years is announced by Caterpillar Tractor Co., Peoria, Ill.



Simple, easy operation of the new bulldozer for "Caterpillar" D8, D7, and D6 Tractors is stated to be possible with this new No. 24 front single-drum cable control, whose line pulls are ample to meet the most severe service requirements. F.P.M. line speed, bare drum, is 357 for the D8, 375 for the D7, and 525 for the D6. F.P.M. line speed, full drum, is 527 for the D8, 552 for the D7, and 78 for the D6.

Drum diameter for all three models is 9 in., length 2½ in., and drum flange diameter 14 in. With ½ in. cable drum capacity is 75 ft. The clutch has 12 friction surfaces with an area of 564 sq in. Clutch facing is metallic and the brake band diameter and width in each model is 15 × 2½ in. The effective brake area is 111 sq in., brake lining is molded, and the approximate weight of each model, including adapter group, is 550 lb.

Features of the new No. 24 cable control include: rapid, positive action, with fast free spooling when desired. Synchronized brake release and brake engagement, also add to smoother operation and greatly reduce wear and heating. All normal adjustments of clutch and brake mechanisms can be made quickly and easily from the outside of the unit. Removable covers permit ready access for inspection or replacement of internal parts.

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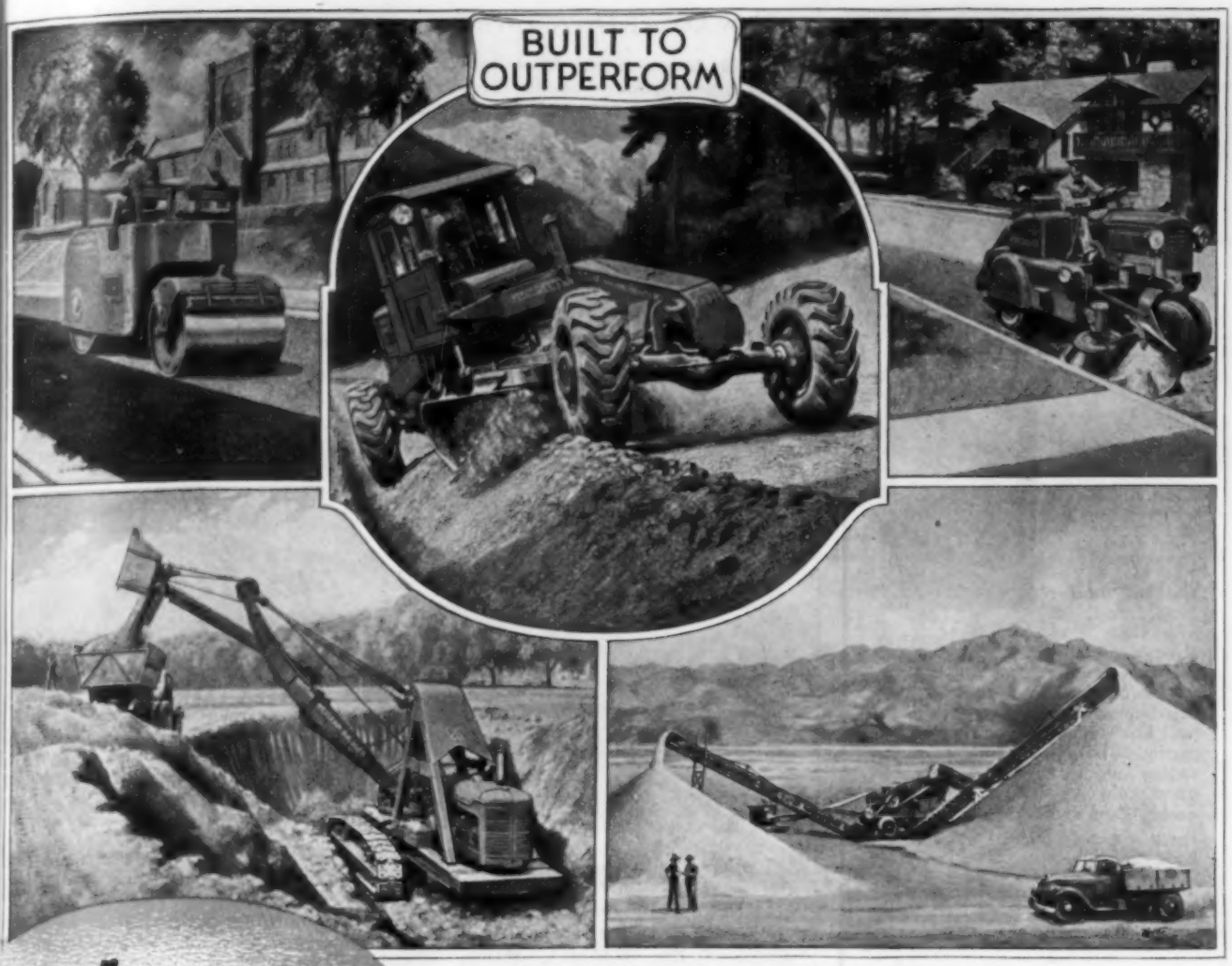

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CONTENTS

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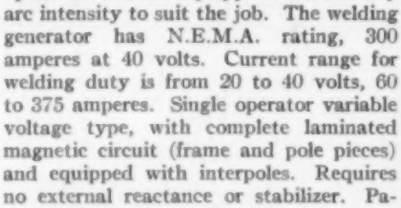
New Diesel-Driven Welder

A NEW DIESEL engine driven welder of 300-ampere capacity specially made for use in locations where electric power is not available, or not economical, is announced by the Lincoln Electric Company, Cleveland, Ohio.

Powered by a two-cycle engine, this addition to the Lincoln "Shield-Arc" welder line cuts fuel costs up to 86 per cent, depending upon the price of fuel oil used. In many cases, total savings, including such items as transportation of fuel, losses, etc., are reported to be as high as forty cents per hour. Engine features include a simplified fuel arrangement with complete fuel filtering system.



Equipped with Dual Continuous Control, this Lincoln welder permits the operator to select any type of arc and any arc intensity to suit the job. The welding generator has N.E.M.A. rating, 300 amperes at 40 volts. Current range for welding duty is from 20 to 40 volts, 60 to 375 amperes. Single operator variable voltage type, with complete laminated magnetic circuit (frame and pole pieces) and equipped with interpoles. Requires no external reactance or stabilizer. Patented dual control of welding current is accomplished by adjustment of both series and shunt fields. Supplies uniform welding current for metallic arc welding in any position with bare or heavily coated electrodes, also for carbon arc welding. The generator control can be adjusted in continuous sequence of fine steps by means of shunt field rheostat. Current can be adjusted independently of open circuit voltage by means of series field current control.

The generator frame is attached to the diesel engine bell housing and the generator shaft is connected to the engine flywheel by a special type of flexible coupling. The entire unit is mounted in a substantial channel frame. A sturdy metal grille protects the radiator front, and the pressed steel canopy of the welder is supported by heavy structural steel members. Two side doors and a hinged door at the rear provide easy access.

The new "Shield-Arc," 300-ampere welder (stationary model) weighs 2560 lb. and can be mounted on wheels, trailer, or truck. Optional equipment includes spring mounted running gear of automobile trailer type with four-wheel pneumatic tires.

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WELL WATER SYSTEMS
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Ventilation Tubing

A NEW TYPE OF FLEXIBLE TUBING, non-collapsible under plus or minus pressures and retractable to about one-eighth its extended length, is announced by The Warner Brothers Company, Spiratube Division, Bridgeport, Conn., for portable or semi-permanent ventilation or any handling of air, gases, or light solids. Its spring steel helix core causes it to spring out, like a jack-in-the-box, to its fully extended length, and it will stay in this position regardless of whether it is working on pressure or suction.

A feature of the Spiratube construction is the method of spiral-stitching the spring core within the fabric. The inside surface is free of wire ridges, providing far less resistance to air flow and no obstruction to the passage of solids. Sharp bends can be made with only slight reduction of air flow and without the use of elbows or special fittings. Spiratube is considerably lighter than metal duct or moulded tubing, and takes up less space when retraced. The standard Spiratube is made on long-fiber duck, having a bursting strength of 170 psi; the fabric is processed fire-resistant and covered with tough, durable thermoplastic. It can also be made to specification in a variety of other fabrics for special applications. Spiral stitching is done with a double seam of rot-proofed thread. There is no exposed metal inside or out (even the couplings are covered), eliminating the possibility of sparking where explosive or inflammable materials are present. Spiratube is furnished in standard diameters from 3 to 16 in., and in lengths of 10, 15 and 25 ft. Built-in couplings permit quick joining or disconnecting. A bulletin is available.

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Diaphragm Pumps

FULL PRODUCTION of rugged, power-driven diaphragm pumps for general use is announced by Marlow Pumps, Ridgewood, N.J. These diaphragm pumps, which are popularly known as "Marlow Mud Hogs," are available in 3- and 4-in. single and 4-in. double sizes, with capacities from 3000 to 9000 gal per hr.

They are reported to have the following features: non-clogging ball valves, quickly accessible valve chambers, renewable valve seats, powerful steel walking beams which are virtually indestructible, double bushings, long-life diaphragms, clamping rings which permit diaphragms to be replaced in only six to eight minutes, oversized pump bodies, extra heavy gearing and heavy-duty construction throughout. "Marlow Mud Hogs" are popularly used for pumping water, mud, sand, ooze, slush, gumbo, slime, grit, and liquids which contain large amounts of trash. A new bulletin describes these pumps.

Riveting Hammer

A NEW LINE of pneumatic riveting hammers featuring small size, light weight, and rugged construction is announced by the Ideal Commutator Dresser Co., 1363 Park Ave., Sycamore, Ill.

The barrel is of one-piece, all-steel construction with a reinforced end to take piston impact. The piston is made of hardened alloy steel for long and heavy service. The valve block and sleeve valve are made with large wearing surfaces for long tool life and minimum maintenance. An air throttling regulator valve included with every hammer is said to permit very fine adjustment to accommodate all kinds of riveting, even on plain or heat-treated alloy aluminum, brass or soft iron. When used with the proper tool, the Ideal "Air Horse" is also suitable for caulking, scaling, chipping, and other work. A beehive retainer spring is easily screwed on with fingers. The "Air-Horse" is available with offset or grip handle in three sizes for light, medium, or heavy riveting.

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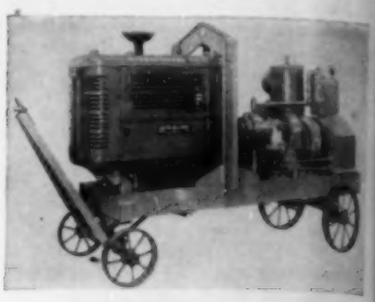
Wellpoint Pump

A WELLPOINT PUMP, powered with an International UD-9 Diesel engine, is announced by the Griffin Wellpoint Corp., 881 E. 141st St., New York 54, N.Y. It is known as Model 108-D, 10 × 8, Vac-U-Matic Wellpoint Pump, and is said to deliver 2,800 gpm. In addition to Diesel power, this pump is said to incorporate



many mechanical improvements, particularly the elimination of all packing in the stuffing box. A catalog "Griffin Pointed Wellpoint Facts" is available from the manufacturer.

Unionmelt Machine Carriage

A NEW HEAVY-DUTY, straight-line machine, known as the Oxweld-Unionmelt CM-37 machine carriage, has been developed by The Linde Air Products Company, 30 East 42nd St., New York, N.Y. It can be used for carrying Unionmelt electric welding equipment, the CMA-21-B attachment for plate-edge preparation, single- or multiple-blowpipe setups for straight-line cutting, flame-hardening equipment, and the Oxweld C-45 Blowpipe for cutting extra-heavy sections.

The use of high-strength aluminum alloys in the construction of the machine provide it with an ideal strength-weight ratio. Its weight as sold, without equipment, is 87 lb; thus it can be moved readily from job to job. Its overall dimensions are 32 in. long, 12½ in. wide, and 9 in. high, plus 2⅞ in. for the forward-reverse lever. The standard machine is equipped with a 110-volt a-c unidirectional motor of ¼ rated electrical horsepower. Reversing is accomplished mechanically through gears. Machines are supplied with speed ranges of 2 to 50 in. per min for general industrial use; and 7 to 210 in. per min for use with the Unionmelt welding process. An electric speedometer is located in the machine cover so as to be within easy view of the operator at all times. There are two calibrations—one for operation on track and one for operation directly on the workpiece.

The CM-37 will operate on CM-21 track, or where accuracy of travel is not important it can be operated on a standard 10-in., 25.4-lb I-beam. It also can be operated directly on the steel plate or other flat workpiece, if desired. With the addition of accessory equipment for plate-edge preparation, flame-hardening, heavy cutting, and other applications, this machine offers the advantages of great flexibility and adaptability.